THE GEOGRAPHICAL JOURNAL

Vol CXVIII Part 1 March 1952

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PROGRAMME OF MEETINGS

Monday March 31 *at* 5 *p.m.*
THE CHANGING PHYSICAL LANDSCAPE. *By Professor S. W. Wooldridge*

Monday April 7 *at* 5.30 *p.m.*
WONDERS OF NEPAL. *Films with a commentary by Ella Maillart*

Monday April 21 *at* 8.15 *p.m.*
THE CONQUEST OF ANNAPURNA. *By M. Herzog and M. de Noyelle*

Monday May 5 *at* 5 *p.m.*
SOME PROBLEMS OF LIBYAN GEOGRAPHY. *By Dr. B. W. Fisher*

Monday May 12 *at* 5 *p.m.*
SPITSBERGEN, 1951 : a symposium on three University expeditions

Monday May 19 *at* 8.15 *p.m.*
EXPLORATIONS IN ARNHEM LAND. *By Dr. Donald Thomson*

Monday May 26 *at* 5.30 *p.m.*
PATAGONIAN PROFILE. *Film with commentary by Dr. Maynard Miller*

Monday June 9 *at* 8.15 *p.m.*
THE VOYAGE OF *DISCOVERY II*, 1950–51. *By Dr. H. F. P. Herdman*

Monday June 23 *at* 3 *p.m.*
ANNUAL GENERAL MEETING

Proposals sent by Fellows to the Director and Secretary before May 31 will be taken into consideration by the Council in preparing the list of names to be submitted to the Annual General Meeting for election into the Council for the ensuing Session.

Light refreshments for Fellows and their guests will be served in the New Map Room after the Evening Meetings. Fellows are reminded that, unless special application is made, only one guest may be brought to Evening Meetings.

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The House of the Society is open from 9.30 a.m. to 5 p.m. on weekdays and from 9.30 a.m. to 1 p.m. only on Saturdays. The Library is open for the exchange of books from 7.30 to 8 p.m. before Evening Meetings. The House will be closed for the Easter holiday from Friday April 11 to Monday April 14 inclusive, and on Whit Monday June 2.

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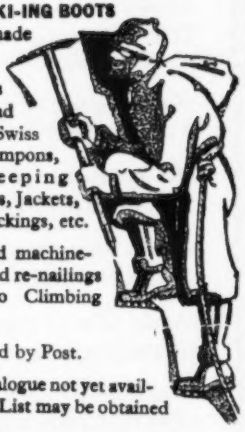

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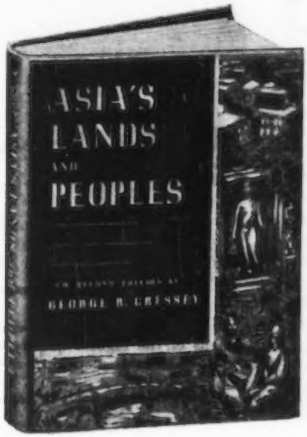

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As most loyal and loving subjects we mourn His Majesty's death in all affectionate regard.

J. M. WORDIE
President

The
GEOGRAPHICAL JOURNAL

Vol CXVIII Part 1 *March 1952*

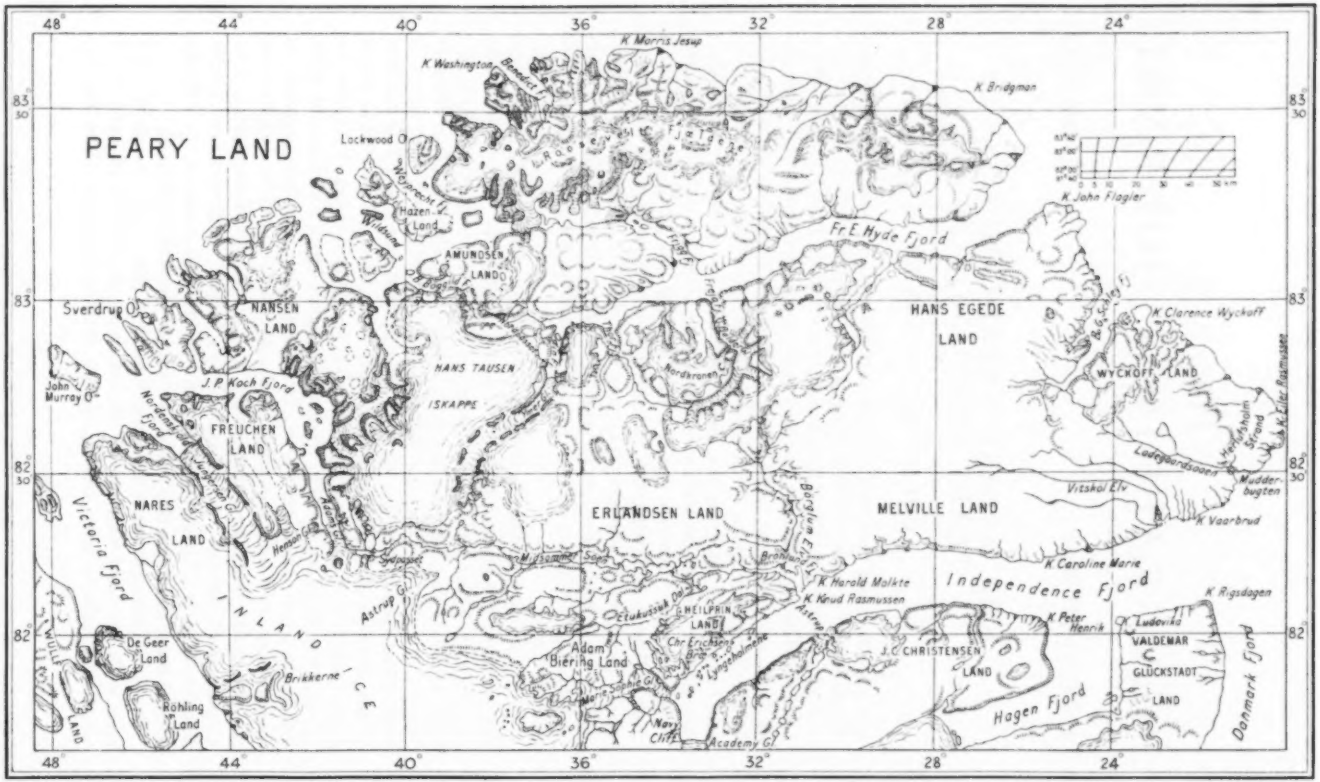
THE DANISH EXPEDITION TO PEARY LAND, 1947–49

COUNT EIGIL KNUTH

IT WAS ON board the *Quest* in 1935 that Ebbe Munck and I laid the plans which in due course led us to Peary Land. Going back three-quarters of a century, it was a Briton who first knocked on the gate of the fortress of Peary Land, and his enterprise can be traced to the Royal Geographical Society and its Honorary Secretary, Sir Clements Markham, at whose instigation the British Arctic Expedition headed by Nares set out in 1875 in the ships *Alert* and *Discovery*. This expedition beat all records for navigation northwards through the waters between Greenland and Ellesmere Island. The *Alert* went into winter quarters at Cape Sheridan (lat. 82° 30′ N.) on the north coast of Grant Land, while the *Discovery* put in at Lady Franklin Bay farther south. From here Lieutenant Beaumont set out in the spring of 1876 on the sledge journey which took him far enough to catch a glimpse of Cape Britannia on John Murray Island, and this may be regarded as the westernmost corner of Peary Land.

Until our entry, all visits to Peary Land had been made by dog sledge from points 600 or 700 miles distant, either from Thule in the west, as did Lockwood, Peary, Knud Rasmussen and Lauge Koch, or from north-east Greenland, as did Mylius-Erichsen and J. P. Koch on the *Danmark* Expedition of 1907. Their stay in Peary Land had to be brief and hardly any scientific material was brought home except sketch-maps showing the coastal outlines. These journeys cost the lives of five men. After Lauge Koch's flight across Peary Land from Svalbard in 1938, details of the hinterland began to appear on the map; in the north the large Frederick E. Hyde Fjord with its many inlets and in the south, instead of Peary's famous channel which was supposed to divide Peary Land from the mainland, a long valley was seen to stretch across the peninsula (Wandel's valley), filled by the big Midsummer lake. This empties itself through one of Greenland's largest waterways into Jørgen Brønlund Fjord. The map of Peary Land nevertheless remained scientifically a blank page, and it was this that we on our part wanted to remedy.

Post-war developments in the aeroplane and its aids—radio and radar—had meanwhile provided weapons for the attack on the fortress of Peary Land which had hitherto been lacking. So we decided to winter there for two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years, and to set up our main base on the remnant of the supposed Peary Channel—Jørgen Brønlund Fjord. The fact that many other rivers beside the big one coming from the Midsummer lake drain into this small and shallow fjord led us to hope that the ice would break in the summer and make it a suitable landing place for flying-boats. The money for the expedition was granted by the government and by the newly established Danish Expedition Foundation which was started by Ebbe Munck. The Grønlands Styrelse placed ships at our disposal and the Danish Navy assisted with their new Catalina aircraft led by Captain Erik Overbye.

As a base for the air transport to Peary Land we chose the bay at the foot of Mount Zackenberg at the head of Young Sound, north of Clavering Island in lat. 74° N. The distance to Brønlund Fjord as the crow flies was 560 miles. The establishment of this base enabled reconnaissance flights to be made in the summer of 1947, and the result proved a triumph to us in that Brønlund Fjord, in spite of scepticism we had met in various quarters, actually turned out to be open for the short period of the summer, and offered acceptable landing conditions. The summer of 1947 thus secured for us the basis of all further activities. Ebbe Munck described this summer expedition in his lecture to the Society two years ago; he has been joint organizer of the Peary Land expedition from the beginning.

In 1948 we began work in earnest with three Catalina flying boats. In twenty-two flights our house, the wireless station with wind chargers and motor, fuel, provisions, a motor-boat, tents, sledges, twenty dogs and the eight members of the expedition were flown forward. The following summer, in spite of an interruption due to a radio blackout and drift ice at the South Base during the period of most favourable weather, all the staff—with the exception of myself—was replaced; six new members arrived as well as eight new dogs and fresh provisions. During the four summers, seventy-five human beings set foot in Peary Land and almost seventy tons of equipment were transported in 962 flying hours. A distance, in fact, equal to five times round the earth at the equator was covered without mishap of any kind.

The dreams and plans of several years had now been realized: a house stood in Peary Land, farther north than any other house in the world and only 540 miles from the North Pole. We not only had a comfortable dwelling-place with everything necessary for the sustenance of life, but the scientists in their private cabins had well-equipped laboratories where they could analyse their material and subject it to a provisional treatment, using the literature available in our library. The first wintering party consisted of eight members, seven Danes and one Greenlander, and the second wintering party comprised five Danes and two Greenlanders. The second party of scientists was able to supplement and carry on the work of their predecessors, so that observations could be carried out continuously over two years.

It may sound a paradox, but Peary Land though uninhabited proved to be a totalitarian state. It was governed by a power which enforced a dictatorial rule, especially in Brønlund Fjord where we democratic newcomers had settled. This force was the wind, sweeping from the head of the fjord over the unsheltered, barren plains of clay, day and night. With sand-drift and driving snow, whose crystals in severe cold were as hard as the sand grains

themselves, it scoured the stones at will. Large and small, these stones all pointed with their smooth polished surface towards the head of the fjord whence the wind came. Some were slowly "eaten up" from one end to the other, some displayed their personality by retaining certain hard edges, and were gradually carved into unequalled masterpieces of abstract sculpture. At high levels one might as it were go to an exhibition, and for hours enjoy the richness of fantasy in the barren wastes.

Our geologist during the last wintering, Knud Ellitsgaard, had as his special object the study of the great North Greenland fold chain which extends from Arctic Canada along the Arctic Ocean to Peary Land. After the formation of this chain, about 300 million years ago, volcanic activity took place and molten magma from the interior of the earth penetrated the sedimentary beds, often solidifying in six-sided columns of dolerite. On an island at the farther end of Independence Fjord the columns are especially beautiful and attain a height of 400 feet. Opposite the base, rose a wall of sediment 10 miles long and 2300 feet high, with its scree slope, as a result of the weathering for millions of years, covering four-fifths of its height. It was an hour-glass which measured time in this new world which we were beginning to understand. Once every year an avalanche of large sand grains rushes down into this hour-glass, and when the whole mountain runs out in this way one hour of the eternity of Peary Land will have elapsed. With new subsidence and upheaval of the land, the hour-glass will be turned to begin afresh.

The instruments in the thermometer screen helped our meteorologist and geographer, Børge Fristrup, to gain an insight into the nature of the weather, the only scientific factor which touched the actuality of the surrounding world. On 22 and 23 April 1950, London experienced a very heavy snowfall which caused great destruction and congestion of traffic; it was supposed to be connected with cold air currents from north-east Greenland. But we still know very little about the influence on the weather in our latitudes exercised by the extensive cold areas—the Inland Ice of Greenland and the Polar Basin. The station at Brønlund Fjord, situated near the latter, offered a possibility of tracing these factors back to their unknown source.

The climate of Peary Land is decidedly high-arctic, being desert-like and dry, with frequent and violent storms, as may be seen in the wind-polished stones. Very different from the normal conditions of life on the earth was the interplay between the five months' constant summer sun and a winter almost as long, which made the year seem like one day and one night. The sunshine recorders registered a larger number of sunny hours during the long day between April 9 and September 5 than is observed during a whole year in Denmark; and it will be understood that for the flora and fauna this abundance of light may compensate for the handicap of darkness and frost. We ascertained, and it is perhaps the most curious phenomenon in the ecology of Peary Land, that during a period of two and a half months in summer there was no night frost at all. The maximum summer temperature and the mean temperature for July were both several degrees centigrade above the corresponding temperatures five degrees of latitude farther south, where night frost occurs practically all through the summer. This is of great significance

Phot. E. Knuth

A wind-eroded stone

Phot. B. Fristrup

Clump of Mountain Avens (Dryas)

Glacier in Etukssuk valley (about 1800 feet high)

Winter station in Bronlund Fjord, 1948

Phots. B. Fristrup

to the melting of snow and ice in Peary Land which (in part assisted by the river water) proceeds day and night, while farther south it is stopped every night by the formation of new ice. It also explains the peculiar fact that ice of Brønlund Fjord, though over 7½ feet thick in May, broke up on about July 13 every summer—two weeks before there was ice-free water at our South Base near Clavering Island.

It might be expected that the long period of darkness would give rise to correspondingly low temperatures. In Brønlund Fjord however we were spared in that respect, for the frequent *föhn* winds were accompanied by rises in temperature which diminished the effects of the cold. The coldest month was February 1950 with a mean temperature of −32° C. (−25·6° F.) and a minimum, on February 28, of −44° C. (−47° F.). But experience from the sledge journeys suggest that much lower temperatures prevail in other parts of Peary Land.

I shall have but little to say of the work of our biologists. Ptarmigan were abundant in the first year, flocks of up to one hundred being commonly observed, but few were seen in the last year. The king eider-duck bred on the islands in Brønlund Fjord, and at the mouth of the fjord we succeeded after many vain attempts in securing a Greenland shark—the best dog food to be obtained, but only safe when it has been carefully dried. Polar bears are very rare; it is too far north for them. We had the pleasure of meeting only one—and that is a story in itself.

The meeting took place when our house was about half finished and the first Pearylanders were sitting in their kitchen tent in the middle of the camp after a long day of house-building. Their sleeping tents stood around outside. Coffee had been served, the primus stove put out and the door shut tightly against the cold. Suddenly there was a clatter of saucepans outside and the zoologist put his head out; but even more quickly drew it back again—a bear!

"Go on—tell us another!" cried the others, though in this case a zoologist should have been able to make the correct diagnosis. It was no use making a dive for the guns as all the ammunition was in the rucksacks in the sleeping tents, and the bear was not likely to let anyone through. The camera man relit the primus and pumped it as high as it would go in order to encounter the enemy with a hissing flame-thrower should he poke his nose in. Absent-mindedly, the good zoologist grabbed his butterfly-net while the more practical carpenter drew his dagger to rip open the back of the tent so as to escape that way. It was the geologist who saved the situation. For at his suggestion all voices united in a measured, clear request: "Go to hell!"; and the bear went. When he had been shot the zoologist took the lead. Down with the net, out with the knife—what do bears live on in Peary Land? The result was startling; the stomach contained only a bar of milk chocolate.

Reindeer formerly lived in Peary Land, and their discarded antlers are sometimes met with; in 1921 Lauge Koch killed several wolves. Both these species have now died off.

Human beings, Eskimos, also once lived in Peary Land. On the capes in Brønlund Fjord stones are found in many places, so regularly arranged in rectangles or ellipses that they are evidently due to the activities of man. They mark tent sites, having served to keep the skin covering of the tent in place and

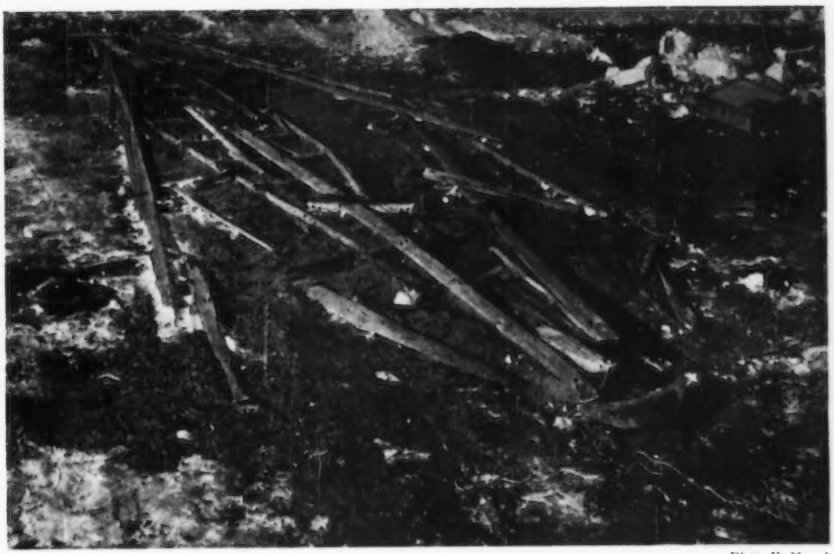
being left when the tent was struck. In Brønlund Fjord fifteen localities with a total of eighty-four of these stone rings were found, the densest remains of habitation in the whole of Peary Land. Thus our own newly established capital seemed to be at precisely the same place where the capital of former days had been. Finds were made in only five or six of these tent rings in spite of a zealous search—small flint implements belonging to the earliest known Eskimo culture in Greenland (the Cape Dorset culture), some of them of types not previously recorded in Greenland. It cannot yet be ascertained when these people lived here but it was probably five hundred or six hundred years ago.

The Dorset people lived in the interior, hunting carribou and musk-ox and catching trout. They were not however the only Eskimo inhabitants of Peary Land. On the outer coast, on the level south-eastern point of Herlufsholms Strand at a distance of 125 miles from our base, large quantities of timber were found in the snow which turned out to be the skeleton of an Eskimo whaling boat 35 feet long. On digging well over 2 feet down into the snow some 100 metres in front of the boat, we found tent sites which fortunately yielded abundant specimens quite different from the flint implements in Brønlund Fjord, and as fresh in appearance as if new. They belonged to a people who had carried on a whale fishery and were of the next earliest Eskimo culture in Greenland, the Thule culture. It is perhaps only a few centuries since these whalers lived in Peary Land. Both tribes had migrated from Arctic Canada along the north coast of Greenland, and continued their migration southward along the east coast where they died off some time in the last century. Clavering met the last north-east Greenland Eskimo family in 1823, in the area where our expedition had established its southern base.

With our expedition, the third immigration of Eskimos or people of Eskimo descent came to the country; and it was good that we had them with us for the exploration of Peary Land is their cause as well as ours. What we Europeans had not the power and courage to do until 1948—namely, to take Peary Land into our possession—their forefathers had been able to do several centuries ago.

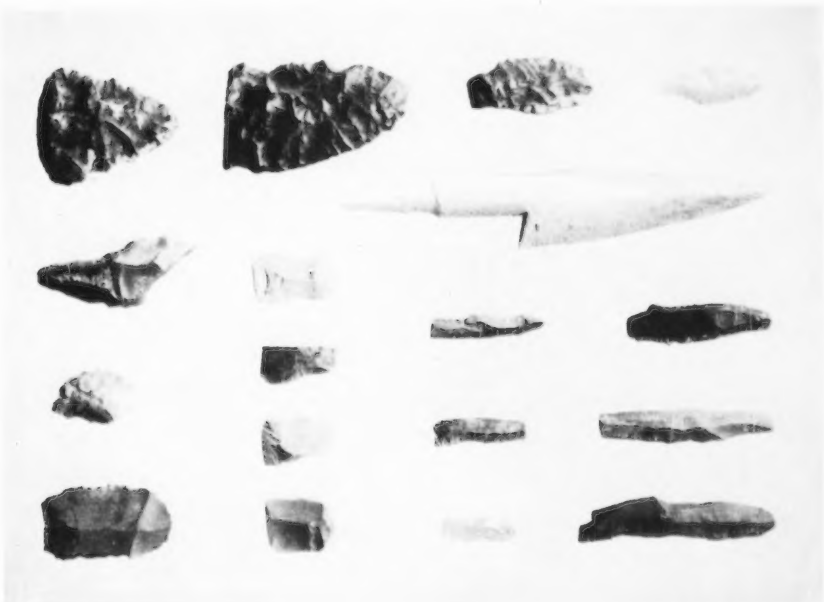
Our wireless operators had the most tedious job of the expedition, making weather observations all day and night and sending reports to Copenhagen. By night, while we others slept, they found consolation in their amateur contacts over the wireless, talking with other operators all over the globe: California, Alaska, South Africa, New Zealand—and especially Honolulu about which however they told us little. Our most remote contact was in the form of a real telegram from the South Pole sent by the Norwegian-British-Swedish expedition in Queen Maud Land. The telegram reached us a couple of days before we started on the long sledge journeys in 1950 and ran as follows:

> "Cordial greetings from the southernmost to the northernmost expedition in the world. All is well at Maudheim, we are preparing to meet the winter, while you are to meet the summer. Members of five nations wish you good luck in the completion of your work.
>
> John Gjaever"



Phot. E. Knuth

Eskimo whaling boat (umiak) at Herlufsholms Strand



Implements of Cape Dorset culture, Bronlund Fjord (slightly reduced)

Then came the wonderful day—the thought that we are not to experience it again is almost unbearable—on which we left the home-bound life of the base in narrow Brønlund Fjord and set out up the large Independence Fjord. I doubt if there is any form of life in this world where one is left so utterly alone, so completely thrown upon one's own resources bodily and mentally, as on a sledge journey of some months' duration across an uninhabited country in the company of an Eskimo whose language one hardly knows. You are alone with the beauty, the grandeur and the problems of nature. No established conventions belittle the scenery which has never been seen before, and on which you are the first to pass judgment. You are the only living thought in a vast country; all sights, all events, each minute for three months, belongs to you and you alone.

A sledge journey is not however all bliss, especially when the temperature falls below −40°, as we often experienced in March and the beginning of April. The heavy loads do not allow you to ride on the sledge during the outward journey and, because of relaying, the same ground has to be covered twice. On negotiating the pressure ridges on the ice you have to manage the sledge with its 400-pound load which refuses to move an inch, you swear and scold the dogs, sweat at one instant and feel cold the next. You lie buried in your sleeping bag for sixty hours while the blizzards lash the tent, you starve but dare not light the primus stove or steal a bit of chocolate from your own ration because it has to hold out for another two months. You speculate and speculate, unearth all memories and friends, make all sorts of plans for the future, and promise that this is the last time that you let yourself be ridden by this nightmare.

But next day when the sun shines on landscapes never before seen by any human being you revoke all your curses, pushing forward into a deep canyon with the records of millions of years on every side; or you round a cape and new fjords and inlets open up before your eyes. You get into your tent after twelve hours' trudging behind the sledge, and there is hot food and cigarettes; better, it seems, than the fare at the most fashionable hotel. Or you dig in the snow and find the point of a harpoon or a small carved ivory figure, or perhaps you come across the frame of an Eskimo boat from bygone days, and the thoughts come swarming in again. You live with the thousand questions prompted by these finds, they puzzle you day and night—and the sun is always in the sky—and there are no more important problems in the whole world.

We set out as two sledge parties travelling in different directions. The geologist Ellitsgaard with Tobias, a Greenlander, went westward through the "Peary Channel" (that is the Midsummer lake in Wandels valley) over a glacier branch of the Inland Ice and cut through J. P. Koch's Fjord to the north coast. Accompanied by Jens, the other Greenlander, I travelled along the east coast of the Peary Land peninsula into the unknown Frederick E. Hyde Fjord and onwards through the "Nordpasset" to the outer coast where, according to Lauge Koch's map, I expected to reach O. B. Bøggild Fjord. As can be seen from the sketch-map accompanying the paper, we were both to meet cartographic surprises. It was worse for me, for after passing through the "Nordpasset" I found myself in a complex of sounds, islands and fjord-

Sledging in J. P. Koch Fjord, Peary Land
Phot. K. Ellitsgaad

branches which I had great difficulty in locating on the available map. Indeed, I did not succeed in locating them until I had considerably altered the main direction of Frederick E. Hyde Fjord and its ramifications. As a result of this the northern branch, Frigg Fjord, was found to turn westward and continue in a valley filled with large glacier tongues and extending towards the coast. B. G. Schley Fjord also differs greatly from its presentation on Lauge Koch's map.

The journey through Frederick E. Hyde Fjord was not only my greatest experience in Peary Land but revealed the most beautiful scenery I have ever seen in Greenland. All through the winter I had looked forward with excitement to the moment when I should head into the fjord, and on Easter Sunday (April 9) Jens and I camped at its corner. Five days later we arrived at its intersection with Frigg Fjord and found ourselves in the centre of an immense amphitheatre with a radius of 30 miles and with 6500 foot high glacier-covered ranges round the whole horizon. The Roosevelt Mountains, the northernmost mountain wall in the world, lay on one side, and on the other the central plateau of Peary Land, with the country's highest isolated peak, Nordkronen, towering over the square where the two fjords meet.

Here we pitched our tent close to the only iceberg in Hyde Fjord, placed by the unknown architect in the middle of the arena. Next day we moved down to the beach, under a low isolated mountain of deep burgundy-red slate, the most subtle colour contrast imaginable to the golden snow all round. And when we dug in a river bed to take sand samples for the geologist, Jens found some pins of wood, pointed at one end and standing in the earth. Not even here were we the first humans; Eskimos had been here before us and had chosen their dwelling place with care, the most northern and most beautiful in the world. Before their tent stood Nordkronen, the acropolis of Peary Land, not only like the sanctuary of Athens in form but, as we realized with wonder, adorned with a veritable forest of columns and ruined walls—but here the work of the wind.

Nordkronen seemed so curious that we had to see it at close hand, and we started towards it at one o'clock in the morning to get the sun on the right side for taking photographs. We waded upwards through deep snow but were halted by glaciers when we had reached half way to the foot of the sanctuary. As a consolation we got an aerial view of it in the summer when we flew on a farewell flight over the country. It is the soul of Peary Land. Isolated it lies in the heart of the country expressing all its vast solitude. With its rows of gigantic pillars, its glaciers snaking in heraldic designs at the foot, it bears witness to the two mighty powers that reign over Peary Land, the wind and the frost.

Looking back from the foot of Nordkronen, we could discern the sledge tracks in the snow from the burgundy-red slate mountain to a little dot which was one of the camping sites of the journey. If we could look back in the same way on our two years' stay in Peary Land, we should see the sledge tracks extending in all directions from the house in Jørgen Brønlund Fjord until they had spun their web over nearly the whole land—a web the threads of which together measure about 5000 miles.

Our sledge tracks in Peary Land have now melted away—an epoch in the

history of the northernmost country in the world, and in our lives, is over. And perhaps the vanished sledge tracks mean the end in another way too; for it may be by heliocopter and not by dog sledge that future expeditions will be made.

DISCUSSION

Evening Meeting, 19 February 1951

Before the paper the PRESIDENT (Sir HARRY LINDSAY) said: This is Danish Evening at the Royal Geographical Society. We have with us His Excellency the Danish Ambassador and Countess Reventlow, also Their Royal Highnesses Prince and Princess Georg of Denmark, and we have Count Knuth who will read a paper on the Danish expedition to Peary Land. Peary Land as you know is a territory of North Greenland, nearest the North Pole, and Count Knuth has been the leader of a Danish expedition to that part of the world. He has spent there four summers and two winters and has led the expedition since the year 1947. He will be showing slides and a film.

COUNT KNUTH: It is a great honour for me to be on the platform of this stronghold of British geographical research, the traditions and the achievements of which in the exploration of the globe compel our greatest respect. Coupled with daring and vision there is an air of success, lightness and humaneness about the British expeditions which make them a model for pioneer work. John Davis reconquered Greenland with a jazz-orchestra at the head, and Edward Parry's youthful flock played music and operettas and slipped through the first voluntary arctic wintering in the world without a single case of scurvy. More recently there were Gino Watkins and Lindsay, whose equipment, technique and sportsmanship became an inspiration for the generation to which Ebbe Munck and I belong. As members of the Courtauld East Greenland Expedition in 1935 on board the *Quest*, we came so close to the British pioneer spirit that admiration grew into a personal debt. I would here like to express my gratitude to Augustine Courtauld, and through him to the Royal Geographical Society of which he is Honorary Secretary, in expressing general Danish recognition of the debt which we on the other side of the North Sea owe to the spirit and vision of British arctic exploration.

I had the pleasure of meeting Commander Simpson in Greenland last summer, and know of his plans for new British activity there. We should welcome this very much, and I wish him support and good luck.

Count Knuth then read his paper

H.E. the DANISH AMBASSADOR: Mr. President, Your Royal Highnesses, ladies and gentlemen, I will begin—I will promise to be very brief—by thanking Count Eigil Knuth for his excellent lecture. I hope he has judged from the applause with which the lecture was received how much he has pleased his audience. We are full of appreciation of the work that he has done in Greenland. Although in his pictures we saw much sunshine and many peaceful scenes, at the same time we could not forget that for an expedition like this many rigorous conditions have to be encountered—storms and the long winter night. We are thankful that he has accomplished so much. We enjoyed also his sense of humour, and the lively incidents of camping and sojourning which he brought

before us. The wild nature of the Peary Land landscape must have fascinated many of us.

Greenland has been for many years under the sovereignty of the Kings of Denmark, and we in Denmark have always felt it an obligation to look after the Eskimos in that region and to explore their culture. We are grateful to the men who have gone out to these regions for what they have done in that respect, and having heard Count Knuth's story and seen his pictures you will agree that the present generation follows the old traditons and has the old pioneering spirit. It has been very interesting to see the members of the expedition at their various tasks, and also to see what an immense help an aeroplane can be in such exploration. But the most important thing in an expedition like this is courage and endurance and this Count Knuth has shown that he possesses in full measure, and the same is true of the comrades who shared his task. I should like to say to him "Thank you very much" for his leadership of this expedition from its first years. I should also like to mention the name of Vice-Admiral Vedel, R.D.N., who has been of enormous importance to this expedition. It is a happy thing for us Danes that we have in common with the British this interest in exploration and the life of adventure.

I feel it a great privilege to come to this Society. I have on several previous occasions been your guest and it was very pleasing to me to hear the President say that this was going to be a Danish evening. We want our explorers to work in with yours and if and when a British expedition goes to Greenland, I hope we shall be able to help them. I always feel that, coming into this Society, I come into a most kindly atmosphere. One other thing I noticed, that Sir Harry Lindsay knows Danish, for he was able properly to pronounce the name "Knuth," which is pronounced in many different ways.

I hope that our cooperation will continue in the future, and that other Danish explorers may come to this Society. We have other expeditions in prospect at the Danish centre, including the *Galathea* expedition. In conclusion I should like to say again how much we admire Count Knuth for the ideals and enthusiasm that inspire everything he does. We respect him greatly, and we are grateful to him for the work he has accomplished.

Mr. J. M. WORDIE: Count Knuth has spoken in a very kindly way of the British expeditions to Greenland and the spirit which animated them. Our expeditions have been very small matters compared with the Danish expeditions to the east coast and we recall with admiration the great Mylius-Erichsen expedition of 1906. Count Knuth's work seems to me fully to equal those great achievements of the past, and it must be a proud thing for Denmark to know that she has someone to-day who can carry on these great expeditions.

Count Knuth has spoken about the remains of Eskimo habitation. It is curious that the Eskimo should have penetrated these far northern regions; they must have been very hard pushed to have found their way so far. We must however take note that Peary Land has three months of warm weather, with temperatures above zero, and it may be that the Eskimo found their way there only in summer. I was wondering as I saw those pictures whether the Eskimo appreciated the scenery of that country as we ourselves do; I think they must have done. No one can see the region which Count Knuth has brought before us—with such descriptive power and illustrated by such pictures—without appreciating its beauty and impressiveness.

The PRESIDENT: It only remains for me to express on your behalf our very great thanks to Count Knuth for his lecture and his film. His Excellency was good enough to compliment me on my pronunciation of Count Knuth's name, but I had had a little practice beforehand. I understand that King Canute, as

we call him in England, is a distant ancestor of our lecturer and at dinner I quoted to him a little rhyme which I had learned in the days of my youth; perhaps I may repeat it.

"When King Canute controlled the waves—
Or tried to, but he muffed it—
Had he but known, it seems to me,
The tide would turn at half-past three,
He really might have bluffed it."

And Count Knuth knew very well what the word "bluff" meant.

COUNT KNUTH: I know that it is against custom to make speeches in return here, but I am obliged to say just a few words. I thank you very much, Sir, and I thank Count Reventlow and Mr. Wordie for all that has been said. But just here at this place and in the presence of this audience I would like to emphasize one more special gratitude—my gratitude to Ebbe Munck.

Too many nice things have been ascribed to me for the happy fulfilling of the Peary Land Expedition, and I want you to know that what has been achieved could never have been done, if Ebbe Munck had not been the idealistic and energetic fellow he is—a man who besides all his sense for actualities is able to keep a distant, abstract and desert Peary Land in his heart. He has been and still is the father of the expedition (as much as I am) and the achievements and the results are his too.

For this I want to thank him in your presence, and also for dragging me to England in spite of all my protests. If my lecture turned out tolerably in spite of my little practice in speaking English, it is due to Ebbe Munck too. Last Sunday when I arrived, he took me from Liverpool Street Station directly to Hyde Park so that I could glean some oratorical experience in your language from the public speakers there. He wanted me to come over to smell the British atmosphere that he himself appreciates so much. He wanted me to meet you—and after having met you I quite understand his love for Great Britain, for London and for Cambridge, and the people here who know the North. I will never regret that I came. For his friendship through many years I thank him, and for all the new friends he led me to find here I thank him too. I am grateful for the kindness that has been shown me everywhere and for the patience with which you have listened to me to-night.

THE KALAHARI TODAY

F. DEBENHAM

FOR OVER A century, since Dr. Livingstone first went there, the Kalahari has been called a desert. It is the purpose of this paper to show that, in brief, it was once a desert, it is not a desert now, and yet that, with careless handling, it could easily become a desert again. In carrying out this purpose we must find answers to the questions, "What does the country look like?" and "How can it be used?", together with the subsidiary queries of "Who lives there?" and even "Who owns the country? Who, in fact, has the right to develop it?"

But before we become just baldly descriptive may I call your attention to the name itself, one more instance of the strange fascination of place-names and the peculiar aptitude of local inhabitants in finding the perfect name for a feature. In particular this is so of nearly all deserts; how fine and full, and spacious as their far horizons, are the names Sahara, Atacama, Kaokoveld and, perhaps best of all, the Gobi. (I blush for my fellow-countrymen in Australia who have chosen to call their most active desert the Simpson and their largest the Great Victoria Desert; and that in spite of the wealth of liquid L's and reverberant R's that the natives offered them in words like Cadibarrawirracanna or Kittikittilooloo.) This delight in place-names is not to be lightly disregarded; most of us have one particular blessed word, though it may not be Mesopotamia. And so the word "Kalahari" trips off the tongue and beckons the traveller today as it did Livingstone and Oswell and Chapman a hundred years ago.

The Kalahari of today is one single feature, best called a "thirstland" as it was by the Boers, but it straddles over the somewhat uncertain political boundaries of South-west Africa, the western province of the Union of South Africa, and the Protectorate of Bechuanaland, with its greater part in the last-named territory. The important things to note are, first that it is on a plateau, everywhere more than 3000 feet above sea-level so that one is apt to roast by day and freeze by night in the winter; secondly that it is so level that a hill of only 500 feet becomes a mountain; and thirdly that almost everywhere there is a surface covering of a fine yellowish calcareous sand, from 5 to perhaps 500 feet in thickness. Finally, this sand is distributed just as it is in a true desert, in ridges and dunes seaming the land in a rough pattern which can be easily picked out from an aeroplane but is not very obvious from the ground.

This pattern alone, even without other evidence, proves that it was once a desert as complete as the worst of the Sahara is now, or as the Namib, the true desert that still fringes the shores of South-west Africa and may well have been the ultimate source of the calcareous sand which has drifted over the Kalahari. To explain the original desert is not so difficult since it is on the right side of the continent and in the right latitude. To account for the increase in rainfall which fixed the dunes and induced the desert to blossom

is less easy; but, even apart from the vegetation, there is plenty of evidence for the fact in the sand itself, which has been altered.

The rain of ages past has leached the upper layers and cemented the lower layers to produce two kinds of rock, which we may here describe as useful calcrete and useless silcrete, though one type grades into the other.

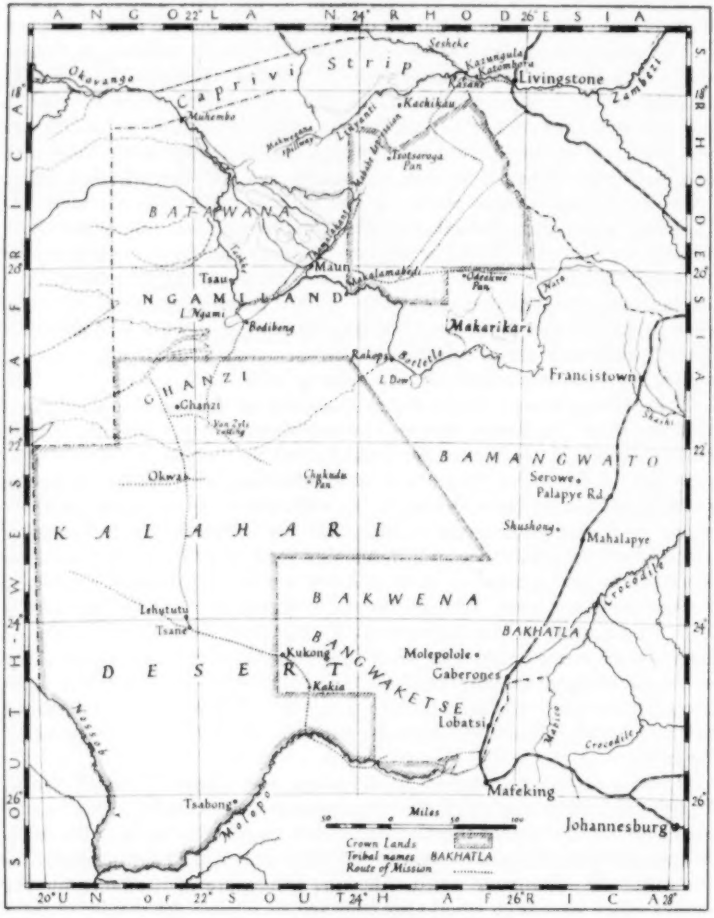
The calcrete is a ragged and porous limestone, and it is found at or near the surface over the more arid parts of the Kalahari. It is easy to sink wells through this rock and its holes and fissures permit water to gather rapidly into the well if any water is present. The silcrete, which is not unlike our own flint, is usually at a lower level, being in fact a replacement of carbonate of lime by fine silica; it is hard, intractable and not absorptive of water. There is no great mystery about the formation of these rocks but their distribution is puzzling, the calcrete often cropping out on the ridges. Boer farmers say that wells should be sited on the tops of hills, where water can be found just below the calcrete. Calcrete is also found, almost invariably, at the edges of the pans, showing as roughly stratified layers on the short but steep slopes leading down to the pan. That it is deposited *in situ* is well shown at Kakia, where the white calcrete is seen penetrating decomposed slates, simulating a volcanic breccia or even a glacial tillite.

These two rocks are however the products and not the agents in the natural reclamation of this former desert. The true agents are of course the plants, whose roots hold the sand from drifting, and the humus, which provides the acids for cementing the grains of sand into immovable masses. Since the plant life is directly due to the rainfall we should now consider what we know about it—little enough in the more remote parts. It falls only in the rainy season, between November and March, and most plentifully from thunderstorms, narrow in extent but quite amazing in their number and significant in their choice of path. Camped on one occasion on a sand-ridge about a mile from a string of four or five pans, we witnessed all day a series of over thirty thunderstorms, often six at once, distinct and separate, passing along the line of the pans and turning them temporarily into sheets of water. Only one of these storms was large enough to reach the camp, but it rumpled our tents, deafened our ears and drowned our fires, in a manner not to be easily forgotten.

It was an excellent lesson for us in caution over accepting rainfall figures in a thunderstormy climate, for if a rain-gauge had been placed in the pans it might well have recorded three or four inches for that day while at the camp it would have received only a quarter or half an inch in the merry ten minutes for which the downpour lasted. Allowing a measure of flexibility for the figures which have been laboriously collected by officials for periods of from eight to twenty years, it is possible to compile rainfall maps of a kind.

From such a map we see at once that the rainfall increases from the south-west towards the north-east, and from perhaps as low an average as 5 inches, a desert rainfall in fact, to as high an average as 27 inches in the north, which is a very good rainfall indeed. The incidence of droughts is however high (probably once in three years), by which one means a very poor rainy season when all vegetation growth is slight; but it should be noted that the vegetation is not killed out entirely.

We therefore recognize a precarious rainfall and that of course prepares us to find that it is marginal country, a term which has been seized upon by geographers and used, often without due discretion, to describe country



The Kalahari

which will barely support man. We have so little marginal country in England that we must now see what it looks like.

For those who know the Brecklands and sand-dune area east of the Broads there is a slender visual analogy in Norfolk. For the fixed dunes near Happisburgh, thinly covered with marram grass and an occasional gorse bush, you may think of the south-western arid part of the Kalahari, also with sand-

dunes, not so high but much broader, and clothed with tufted tussocky grass and a variety of shrubs and thorny bushes, many of which by the grace of Providence are edible. The sand is deep and makes heavy walking, but it is held by the plants, one or two tussocks to a square yard, and does not drift.

In such flat country one might expect long vistas, but the shrubs, growing to a height of up to 15 feet, greatly obscure the view. Curiously enough the scene when viewed vertically at one's feet is quite different from that seen from the top of a lorry at a distance. The close view shows more sand than grass, but with a variety of creeping plants of the cucumber tribe winding snake-like over the bare patches. Some of these are of priceless value to both the Bushmen and the antelope, for they are full of juicy if somewhat bitter moisture and slake their thirst when water is far distant. At one encampment of Bushmen, 30 miles from the nearest water, we saw piles of these melon rinds round the grass huts, their sole water supply for months on end, which it is the daily duty of the piccaninnies to bring in from the surrounding bush. Other creeping plants have adapted themselves in the oddest way for the distribution of their seed by animal transport. Of these the most fiendish is the Devil's Claw, or grapple-plant, which clings to the hoof or the mouth of the unwary springbok, sending the animal almost mad with pain till it is scraped off or stamped off, far from its original position.

The distant view over the waving high tussocks is in the rainy season almost park-like, for the bigger trees, being so largely edible, are nibbled off to the height that antelope can reach on their hindlegs and produce that neat appearance so characteristic of an English estate. At the end of the dry season the scene is however different. Even where the grass has not been swept by the bush fires lit by Bushmen, it is dry and fragile, much of its food value having gone back to the roots of the tussocks. The shrubs themselves may be sere in appearance but they carry the sustenance of the migrating game.

At all seasons the most characteristic features are the pans, which though usually dry may be classified as fresh or salt pans according to the quality of the water they hold in the rainy season. As we have seen, they tend to run in series, following maybe the lower contours, but they may be very large, up to 6 square miles in area. One comes upon them quite suddenly when, brushing the thorny shrubs apart, the lorry dips steeply down, facing a broad flat expanse of glistening white, if it is a salt pan, or the bright green short grass covering a fresh pan. This will usually provide pasture for up to 1000 springbok to the square mile, amongst which will be seen groups of fat little zebra with their companions the crazy-looking wildebeeste, topped by the periscope heads of a few ostriches, always the first to give the alarm. There are now few places in southern Africa sufficiently remote from the hunter's rifle to preserve such countless herds as the centre of the Kalahari.

The origin of these pans is still obscure, and though it seems that the sweeping power of wind is involved, as it is in the deserts of Australia, there must be other factors as well. We dug down through one of these grassy pans to find, below the thin humus on the surface, a silty clay of white particles which is able to absorb a large amount of water and conserve most of it from complete evaporation. No other mechanism can well account for the fact that they are permanently grassed, though there is little nutriment

in the dry season. The fact that they tend to run in series argues that original drainage lines may play a contributory part in their distribution. It was these pans which made it possible for the oxwagons of the first travellers to make their way across the Thirstland during and just after the rainy seasons. To pass at any other season was virtually impossible; and even when digging down into the soil of the pan to search for water, it was possible to go through the impervious bottom and ruin the pan for evermore.

The name "pan," while suitable enough for the small flat areas we have described, since they are quite similar in shape to a tray or shallow frying-pan, is not so happily applied to the vast Makarikari Saltpan which takes up so much space, of so dubious a shape, in the centre of the map. It may seem strange that we still cannot put boundaries to the Makarikari, but it is just as difficult on the ground as on paper. Approaching it from any direction one passes fewer shrubs and more grass, but not till well inside the floodable area can one realize that in an unusually wet season the water might be over one's head. There is very good land on the northern side and there is some prospect of population coming to the Nata river and existing happily on a pastoral economy, aided in the future by a larger reservoir which might be used to irrigate the flat lands below it—which are still above the reach of the brackish water. The road from Francistown to Maun, passable only by lorries and then after permission has been given by the authorities, crosses tracts which simply beseech use as pasture for stock, and for which they are fully equipped by nature except that wells must be sunk to reach the water, here rarely more than 20 feet below the surface.

Within that belt our party found what we called Paradise Pan, on account of its charming situation and abundant game. It is not on any map to my knowledge, though it was probably seen by Chapman and Baines in 1860. It is about 8 miles long and 4 miles in breadth, and is clearly a drainage area into the main Makarikari. Contrary to the usual habit of pans it has clumps of fair-sized thorn trees as islands in the sea of grass. It was here that we had the good fortune to see a single herd of no less than 400 eland, and the camp narrowly escaped extinction through a midnight stampede of buffaloes, gemsbok, wildebeeste and zebra. It was curious to note in the utter darkness that one could recognize the sharp patter of the zebra hooves quite distinct from the rattle of the cloven feet of the buffalo. Lions of course lurk in the precincts of such a pan and must have been responsible for the alarm. Curious too to note the solemn conclave we had as to whether we should put Paradise Pan on our map and thus expose it to the visits of hunters. I as a geographer had to insist on the whole truth, but it may not appear on a map until it is safely within the firm jurisdiction of the Colonial Development Corporation.

Farther north, the heavier rainfall and the deeper sand diminish the grass as compared with the larger shrubs, many of them thorny, and the timber-sized trees at the northern end. It is a different Kalahari from that in the south, but even more waterless. Pans are not so frequent and it is almost credible that some are caused by the elephants, treading and spreading a once tiny pool until the mud of their tramplings has made it impervious to water. In this part of the Kalahari one may even hobnob with elephants, since there are so many, but the looming shape of an elephant in the low scrub and the readiness of those tent-like ears to sweep forward in warning would prevent

undue familiarity. The elephants are so fierce because in the dry season they move up to the banks of the Zambesi where, shot at by the slugs of native guns, they have declared war against all humans and indeed account for one or two deaths every year. It was during a traverse of some 700 miles in this area that we met the only human inhabitant we could find—a solitary Bushman searching for honey.

In all this 800-mile stretch of semi-arid country the true inhabitants probably do not exceed four or five thousand; Dr. Livingstone declared that the Kalahari was the last refuge of the oppressed. That is true enough, and the various tribes who have made a temporary home there have been driven there by pressure from all sides. In the time of Livingstone it was the raiding parties of Mosilikatse with his Matabele, followed by the Boers trekking into the Transvaal, who pushed the Bechuanas beyond the true margin of the Kalahari, only to re-emerge under the protection of the missionaries. Fifty years later it was the Hereros, or Damaras as they are more often called, who fled from the German war of extermination to die in the pseudo-desert or trickle north to Ngamiland, where one still sees their tall athletic men herding their long-horned cattle or their fine-looking women with the curious traditional head-dress. None of these were inhabitants in the proper sense, nor even the wandering groups of the Ba-Kalahadi, who are Bantu in origin and exist partly as herders of goats and partly as serfs of the true Bechuanas to the east. The true inhabitants of the Kalahari are the Bushmen; but here we are apt to confuse several types of people under a common name. We must therefore specify that the permanent inhabitants are the small yellow Bushmen, who are different in colour, character, and mode of life from the taller Bushmen to the north of the Makarikari Saltpan, who are associated more or less closely with the Bechuana tribes. These yellow-skinned Bushmen are so fascinating, and so little known except to anthropologists, that they deserve a fuller description than the Bantu.

We had heard that there were very few true Bushmen remaining, yet we did meet at least 150 who seemed to be completely aboriginal, and by deduction there may be up to ten times that number whom we missed in that south-west area of the Kalahari. In appearance they are entirely different from all the Bantu races, and sufficiently distinct from the Hottentots to prevent any confusion. In spite of the shyness which caused them to hide their weapons when they came up, they were extraordinarily eager to make acquaintance with our party, and a gift of an odd cigarette or the blackest tobacco twist quickly put us on terms of friendship. Their sense of humour is really highly developed, and the best instance of that arose over their complete inability to climb on or off our lorries. Having one interpreter with us, we usually invited any group that approached us to come to the next pan, where we would divide with them any meat we could secure. Our Bantu boys had to lift them on to the lorries, which in itself caused much amusement. Arrived at the pan we naturally let them make their own way off the lorry, but they could not manage the little jump of four feet. One and all either misjudged the distance or threw out their arms and fell to the ground, while all joined in the laughter. This inability to jump four feet interested me, as I felt sure that they must have had much practice in climbing the low trees which dot the landscape. By dint of perseverance through the interpreter I found they had no such

practice: " Why," they demanded in effect, "should we want to climb trees? There is no profit in that." When I suggested that trees would give vantage-points for seeing the game they were after, they became quite merry, saying that the last thing they wanted was to see the game or be seen by it—"The whole story of the game is written in the sand at our feet, so why this silly climbing of trees?" Their ability at spooring animals and interpreting every mark on the sand equals if it does not excel the skill of the Central Australian blackfellows, and is quite incredible to witness.

As far as we could see, their mode of life is exactly the same as that described a hundred years ago by Chapman and Baines. Probably the basis of their diet consists of roots, tubers, and such small fry as mice and frogs, but every now and then a successful hunter transfixes a large animal with his poisoned arrow. Off goes the animal and the hunter takes a snooze or goes back to his family to tell them about it. The whole family then track the animal for the few hours that it will take to die from the poison if a springbok, or for two or three days if a giraffe. When they reach it they camp by the carcass till every scrap is eaten. They are far from dainty as to the state of the meat, but they realize that decomposition may go too far even for their palates; consequently they are prodigious eaters and have developed an astonishing elasticity of stomach. The older men, in particular, have vertical creases in their tummies the better to accommodate these gargantuan feasts. We were told on reasonable evidence that the record for one man in one day was 58 lb. of meat. His own weight was probably not more than 100 lb.

Their deftness at skinning and saving every scrap of blood and flesh is extraordinary. Their knife nowadays is often a piece of hoop-iron, carefully sharpened after every two or three cuts. The stomach is turned inside out to get rid of the green fodder inside it, then used to save every drop of the blood before cutting-up has gone very far; the delicacy with which they press out the contents of the intestine is striking. It was obvious that there was a certain ceremonial connected with the division of booty; the younger boys were not allowed even to handle certain parts of the carcass and there was a strict order of seniority in the business. The women did not accompany us on these hunting trips but they too were avid for cigarettes and had most distended tummies; as far as one could see they were the gatherers of roots, melons, etc., but ready at a moment's notice to follow a signal to the latest food killed.

One other instance of their complete adaptation to their surroundings is their mode of securing and storing water where there is nothing but damp sand from which to procure it. Livingstone describes what he knew as "Bushmen's sucking-wells" (now known as "sip-wells"). The procedure is as follows, and is usually carried out by an old woman. A certain plant serves as indicator of damp sand at the spot chosen and the woman proceeds to scrape a hole in the sand to arm's length. She then takes a grass stem or hollow reed, surrounds one end of it with fine roots or grass, and places that end in the bottom of the hole. The sand is then carefully replaced round the reed and firmly tramped down. After an hour or two the woman begins to suck through the reed, producing of course a semi-vacuum in the wad of grass buried below. The sucking has to be maintained for anything up to an hour before the pressure of the atmosphere has pressed the films of water round

each sand-grain to the bottom of the reed. The water then comes up into the woman's mouth, and she inserts a second and shorter reed in the other side of her mouth leading down to a small hole at one end of an ostrich-egg. She alternately sucks with one side of her mouth and expresses the water from the other side down the reed to fill the ostrich-egg shell. A number of these are filled, carefully sealed with clay, and buried in different parts of their hunting territory for use when the dry season comes upon them. One wonders how the sip-well technique could have been devised. An old traveller of the Kalahari, an Australian who was left there after the Boer War, described to me how he and his companion with four donkeys were kept alive for a fortnight by the ministrations of a single old Bushman woman with her sip-well. It gave time for them to dig a well 30 feet deep and establish the present flourishing little settlement of Kakia. Our contacts with these Bushmen, as we passed rapidly through their hunting grounds, were pleasant if brief; but our attempts to acquire some of the words in their extraordinary click-language were somewhat feeble.

The space we have given to these interesting folk leaves scant time to discuss the future of this marginal land of the Kalahari; but developments are very much under review at the present time. The Colonial Development Corporation, whose duty it is to investigate projects beyond the reach of either private enterprise or native authority, has had its eye on the ranching possibilities for some time. Its interest culminated in the sending of a mission of investigation in the rainy season of 1950, of which I had the honour of being Chairman.

Our object was to investigate the two large areas of Crown Lands, and this was done by following the routes marked on the map (page 14), a total of a little under 2000 miles. Thanks to the skill of my organizer, Colonel Van der Post, the whole trip was accomplished with few adventures but many excitements, and in entire harmony throughout. Much of the excitement was due to our crossing trackless parts of the territory in our four large lorries without quite knowing what supplies of water or what obstructions we might meet with. Two of our lorries had large steel fenders well in front of the radiators with which to crush down the opposition of all vegetation, including trees up to 3 inches in diameter. This is a standard practice in the territory, and is known as "bush-bashing." It is a very impressive method of clearing the way, its chief disadvantage being the multitude of thorns, twigs, leaves, caterpillars, spiders, etc., which are brushed off into the cab of the lorry. The native boys on the back of the lorry cover themselves with a tarpaulin, otherwise even their tough skins would be scored to rags. Another disadvantage is that it makes a strictly one-way road; thus for a few miles we tried to go in the opposite direction to the lorry which had formed the original track, and in a few minutes had pierced our radiator and damaged the windscreen against the points of the saplings, now all directed against our advance.

It is obvious that land which supports so much game needs only a regular supply of water to fit it in some degree for ranching. Arrangements had been made to drill twelve bores along a certain line and these we found were yielding an ample water-supply at depths of under 200 feet, only one or two being brackish. Since that time more have been drilled and the result appears to be about 4 per cent. blanks and 4 per cent. brackish as opposed to over

90 per cent. good water. Our next subject of investigation was the suitability of the feed, from which my expert fellow-missioners could assess the carrying capacity. The upshot of the inquiry for the northern section was that with careful management—a very vital element in any project—there was a future for extensive ranching, but that progress should be slow, almost as a series of pilot schemes. The possibility of erosion spoiling the future was guarded against by a recommendation for controlled grazing. This means extensive fencing at a cost which only a large corporation could consider. You have seen from your newspapers that this northern project has begun, associated with an agricultural project near the Southern Rhodesian border.

After refitting at the charming little settlement of Maun, we proceeded to inspect the much larger and more doubtful area of the southern part of the Kalahari. Our doubts as to its being suitable from the point of view of feed were soon settled, for it is a much more natural ranching land than the more wooded northern section. On the other hand very few wells and no bores have been put down in this section, so that all recommendations had to be contingent upon a survey of the water resources which has yet to be made.

We may sum up the description of the Kalahari of today with a glimpse of what may be the Kalahari of tomorrow. As far as the ranching is concerned it is in the first place a matter of finding water in the sands, in order to scatter water-points over these vast areas so that full advantage can be taken of the feed while at the same time using careful control of the pasturage lest wind erosion be invited. While water is the first requirement for such development, I would give the second priority to good management. It must be realized that even in the once rich grasslands of the Western States of America, the ranches were never comparable in size or in initial capital expenditure to those which the Corporation will have to establish in the Kalahari. Yet the full investigation of the prospects of such a future is the whole duty of such a corporation. Even if our preliminary cautious assessment of 40 acres to one beast is not improved upon, the 60,000,000 acres of land which has never yet provided more than ivory will begin to count in that production of food from marginal lands which is now the lot, and indeed the duty, of far-seeing governments all over the world.

So far I have omitted all reference to that north-west corner, which I like to call the Okavango Triangle. It is not truly part of the Kalahari, but it needs mention because in time to come it should be the most productive area in the whole Protectorate. Surveys are even now being undertaken which may tell us what best to do with the excess of water there, so strangely "apposed" to the Kalahari thirstland. Even then economic development will depend upon communications, either with the railway 300 miles to the east or with the coast 500 miles to the west; ranching is the one industry which can walk its products to market or rail instead of having to carry them by expensive means of transport.

The plan at present outlined for routes to railhead is that, for the northern project already launched, the breeding area will be in a belt immediately north of this long stretch of the Makarikari. The store cattle will be gradually moved northwards until at three or four years of age they will reach the subsidiary agricultural area in the Matetsi corner of the Protectorate, there to be held for finishing, or walked straight through to railhead at Matetsi siding on the Bulawayo–Livingstone railway.

I should also refer to the wise move on the part of the Colonial Development Corporation in establishing a cold-storage scheme at Lobatsi. This has little or no connection with the scheme for ranching in the northern Crown Lands but it will be of immense benefit to the many native stock-owners outside the true Kalahari who have hitherto been at the mercy of beef-rings in the Union as to the prices obtained. When the cattle can be slaughtered at railhead and the beef preserved in a chilled condition for a favourable moment for supplying markets, the trade in beef will at last be completely free from the gluts and scarcities and market-riggings of the past.

You will be anxious to hear of the effects of such vast projects on the inhabitants of the Protectorate. In the tribal areas outside the true Kalahari the cattle industry is almost entirely in the hands of the Bechuana peoples. The efforts of wise rulers such as the ex-regent Tshekedi of the Bamangwato, and Bathoen, the equally wise chief of the Bangwaketse, are slowly improving the grades of cattle kept and the methods of management. The careful husbandry of a large corporation will undoubtedly amplify these improvements, if only by providing competition for the best beef, quite apart from the more stable market which should come as a result of the Lobatsi cold-storage scheme. In the Kalahari itself the people concerned are the Bushmen, wandering groups of Ba-Kalahadi (at present mainly goat-keepers) and a small settlement of five hundred Hottentots near Lehututu, also subsisting on goats. The two latter peoples may or may not decide to take employment under the Corporation if it reaches their area. The real unknowns are the little yellow Bushmen whom we have described. They would no doubt prefer to be left quite alone with their freedom to continue what we should call their hard method of subsistence; yet one which they would not willingly exchange for any form of control or civilization. A few of them have been persuaded to assist in the small local dairy-farming industry of the group of farms known as Ghanzi. It is therefore my belief that the nomad Bushmen will ultimately be persuaded, like the Central Australian blackfellows, to become cattle-minders and stockmen with the ranching organization. Once they learn to climb up four feet, or jump down, they are sure to take to horsemanship, and for reasonable periods become ranch-riders. Certainly they will be of the greatest possible assistance in finding lost cattle, tracking down marauding lions, and coping generally with the conditions which are normal life to them but a menace to the white man.

The total employment under the provisional ranching scheme will not be high—perhaps hardly more than a few thousand natives and a hundred Europeans. Stores and equipment may have to be brought long distances by lorry, but the general management and handling of the stock will, it is to be hoped, be done, as in cowboy days in America, by means of horses; which to white and black alike will become the real fascination in what might otherwise be an isolated and monotonous occupation.

It will be seen that the Kalahari of today is very little different from that of yesterday, and there will be people who would leave it so. I hope myself that the Kalahari of the future will be able to enter the complicated field of food production and yet not lose either its charm or its contented little people.

DISCUSSION

Evening Meeting 22 October 1951

Before the paper the PRESIDENT (Mr. J. M. WORDIE) said: We are fortunate in that we begin a new session with a lecture by Professor Debenham. He is well known to many of us as he has lectured to us frequently. It is three years since he retired from the professorship of Geography at Cambridge, but during that time he has shown how a professor who retires at the age of sixty-five is still very much alive. He has found for himself a new career, that of advising the governments concerned on geographical problems connected with the African continent.

Professor Debenham then read his paper

The PRESIDENT: We have with us Sir Evelyn Baring who has recently returned from serving for a period of seven years as High Commissioner for the United Kingdom in the Union of South Africa, and as High Commissioner for Basutoland, the Bechuanaland Protectorate and Swaziland.

Sir EVELYN BARING: I am sure you have all enjoyed as much as I have the admirable address we have had from Professor Debenham. I have enjoyed it particularly because, as has just been mentioned, I have spent seven years in that part of the world. During those seven years I have had one or two opportunities of travelling in the Kalahari, and I can therefore assure you that he has given us an extraordinarily well-balanced account; not simply the dry economic facts of the scheme now with the Colonial Development Corporation, but the background of this great, and almost desert, land itself. He has brought out its charm and its extraordinary interest, and has also drawn our attention to the human life in the Kalahari. At the same time, Professor Debenham has described in a precise and clear form some of the developments which we who have been working in that area hope may, with good management and also with good fortune, take place in the near future.

As I am an administrator, and administrators are dry-as-dust people, my few remarks will be confined not to the romantic side of the Kalahari but to the dull economic facts. You will probably have gathered from Professor Debenham's address that the Bechuanaland Protectorate can be divided into three zones. Most of the African inhabitants of the Kalahari live in the east, on the border of the Union of South Africa; in the north-western corner there is that great river the Okavango, coming out of Angola and dissipating its waters over Ngamiland in the same way that the White Nile does in the Sudan; between these two there is the third zone, right up the centre of the Kalahari itself. Those who have to administer this area are faced at once with the problem that its population works out, over all three zones, at one person per square mile; and when there is a vast area with a very sparse population practically all the expenditure goes in administration. If therefore administration is to improve, if the health, education or agricultural services are to become better, it is necessary to find some large-size wealth-producing unit. That seems to me to be the economic problem of the Bechuanaland Protectorate, just as it was in the past the economic problem of the Sudan—a very similar country on a larger scale. The answer in the Sudan was the cotton and grain scheme. We hope that in Bechuanaland we shall find some sort of answer too, and it is towards finding such an answer that Professor Debenham and the other members of his mission give us so much help. If it is possible to find more water under the surface of the ground, Bechuanaland is, as Professor Debenham has said, a type of country which South Africans describe as "sweet veld"—with grass palatable to cattle and staying palatable during the winter. The hope of the future seems therefore to be mainly in the development of the cattle industry.

As there are the three zones, so there are three developments one should have in view. The first is for the abattoir and cold-storage scheme at Lobatsi, in the south of the territory, which has been undertaken by the Colonial Development Corporation. Very wisely it has taken advice from those who have already carried out a similar scheme and succeeded with it in Southern Rhodesia; a Southern Rhodesian consultant with good experience is being put in charge of the scheme at Lobatsi.

Secondly there is the question of what can be done with the waters of the Okavango river in the far north-west. There are many possibilities, agriculture, grazing and the development of a vast area of silt where perhaps we shall find a soil similar almost to that of the delta of the Nile; but before anything can be done there is much to be found out. With money made available by the Colonial Development and Welfare Act of 1945 a survey has been started by the Government, and that is continuing. As far as one can guess about the future, my own guess would be the same as Professor Debenham's. There may not be any irrigation of the Kalahari, but what may come, though many difficulties will have to be overcome (for instance an acute *tsetse* problem), is the reclamation of part of the marshy area in the north-western corner; and, having reclaimed it, irrigating it and growing crops on it and then running cattle on the really first-class pasture which exists there.

Thirdly there is the ranching, which is what Professor Debenham was investigating. He has told us of two Kalahari areas, one in the extreme north, the Crown Lands, and one in the west around Lehututu. The first has not such good grass as the second but it is much more accessible. When developing ranch lands it is first necessary to ask if there is the grass for the cattle to graze on, and bushes for them to shelter under: secondly, whether sub-soil water can be reached by shallow wells, or even by deep borings. Up in the far north the results of sinking bore-holes have been good and the Colonial Development Corporation has already surveyed part of that enormous area. It is still uncertain whether there is sufficient grass there to allow of starting a big cattle population. The scheme will depend on good management; if the management is bad, if there is over-stocking and too many cattle are brought in, then there will be serious trouble and the scheme will go wrong. If on the other hand the management is good, if, as Professor Debenham wisely said, the advance is very gradual indeed, and if the Corporation remembers when dealing with this area the mistakes others have made elsewhere in Africa by rushing things too quickly—with too few pilot schemes, trying to take a short-cut and going against Nature—if things are done slowly and there is in charge someone with experience of Southern Rhodesian ranching (because there the conditions are similar) then we hope to succeed, in part of the northern area at any rate. I for one think it would be wise for all concerned to be careful during the next two years not to set their target too high, not to put any very ambitious figure on the cattle population; but to bear in mind that in this northern area of the central zone there will be only the agricultural scheme and comparatively modest ranching because a great part of it consists of trees, scrub and thicket. It is a high rainfall area where deep-rooted vegetation does better than shallow-rooted; it is not a good ranching area. My own personal guess is that up in the north, with good management, there will be nothing sensational, and that perhaps the real future of the big cattle ranch (provided that the bore-holes come out well) will be away in the west where the grazing is very good.

This may, though put imperfectly, give some idea of how we hope to develop this Protectorate for the benefit of the Africans who live in it. May I say again that Professor Debenham's address brought back to me the really delightful days spent in travelling in that fascinating part of the world.

THE GEOGRAPHICAL HISTORY OF THE MESOPOTAMIAN PLAINS

DR. G. M. LEES, F.R.S. AND N. L. FALCON

OUR PURPOSE is to approach the study of the early geography of the head of the Persian Gulf from a geological view point. The geological evidence conflicts with archaeological reconstructions and it seems certain that the real course of geographical history has been far more complex than the archaeologists have assumed. The most recent event has been, contrary to archaeological opinion, an advance of the head of the Persian Gulf and it is probable that advance has alternated with retreat throughout historic and pre-historic ages.

It is usually assumed by archaeologists that there has been a gradual retreat of the sea to the south-east in the Mesopotamian[1] area, due to normal processes of delta formation. The vast amount of silt carried down by the Tigris, Euphrates and Karun rivers is supposed gradually to have filled the Gulf; Seton Lloyd,[2] for example, shows the head of the Gulf before 4000 B.C. about 60 miles north-west of Baghdad, and in Sumerian times he shows it in the neighbourhood of Ur, 230 miles farther south-east. The evidence now presented indicates on the contrary that the head of the Gulf may, at the dawn of revealed history, even have been seaward of its present position.

The archaeologists' conception of the development of the Mesopotamian plains was supported at the turn of the present century by the geologist de Morgan[3] who, having explained the general principles of delta formation, attempted to show how the advance of the deltas of the Euphrates, Tigris and Karun rivers conforms to type. In reconstructing the early geography of the area south-west of Ahwaz, de Morgan discusses the voyage of Nearchus in 325 B.C. as described by Strabo, and also Sennacherib's expedition against Elam in 696 B.C. as described in Assyrian documents. An attempt to fix localities, and the shore line, by a study of the various distances given in the accounts of these expeditions was summarized by de Morgan in two maps (see Fig. 2), but it must be borne in mind that no single place named in these old records can be identified; the maps are based only on guesses of localities. In 696 B.C. the head of the Gulf is shown south-south-west of Shush, with the Tigris and Euphrates flowing into it separately about 40 miles apart. In 325 B.C. the sediment carried down by the Karun, shown as debouching at Ahwaz, is assumed to have formed a chain of islands stretching south-west from Ahwaz right across the Gulf, thus isolating a lake into which flowed the still separate Tigris and Euphrates. Implicit in de Morgan's picture of the early geography is the idea that since 325 B.C. most of the land growth at the

[1] The word Mesopotamian is here applied, in a broad sense, to the alluvial plains associated with the Tigris and Euphrates and their tributaries. It embraces both Iraq and Persian territory.

[2] Seton Lloyd, 'Twin rivers,' Oxford, 1943, p. 19.

[3] de Morgan, 'Délégation en Perse, Mémoires,' Paris, 1900, Tome I pp. 4–48.

head of the Gulf has been due to the sediment brought down by the Karun, which is visualized as bridging the Gulf in the same sort of way that Derwentwater and Bassenthwaite Lake were separated from an originally continuous sheet of water by the sediment carried down by the river Greta. This simple conception offers no explanation for the failure of the combined Tigris and Euphrates to silt up the considerable area of the Hor al Hammar and the marshes of the lower Tigris, which correspond approximately in position to

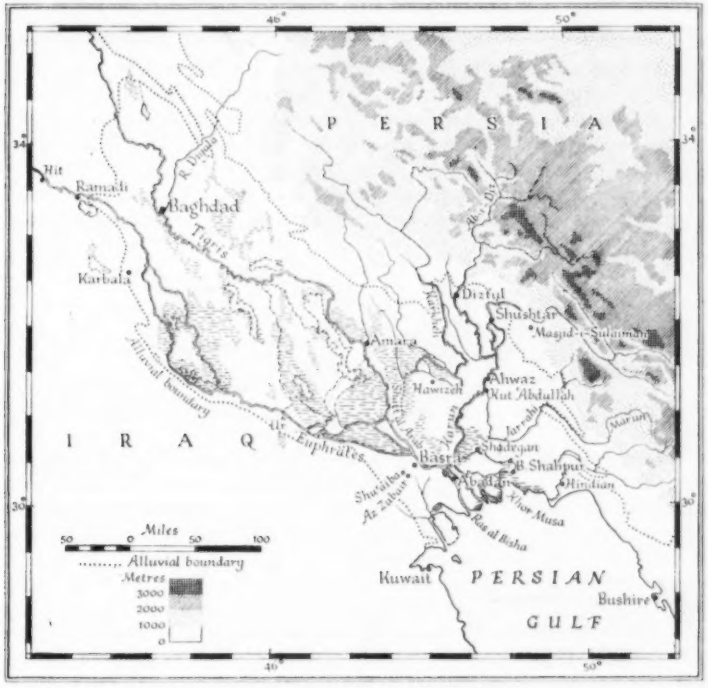


Fig. 1. The Mesopotamian plains

de Morgan's lake. As will be shown later, the basis of his reasoning is untenable on geological grounds.

Sir Leonard Woolley,[1] during his excavations at Ur from 1926 to 1929, discovered an 8-foot bed of clean clay separating pottery and other remains of Sumerian age from the relics of an older period. The relics of this older period, which included numerous flint implements, contained painted pottery similar to that previously found at the pre-Sumerian village of Al 'Ubaid some miles west of Ur, as well as some pottery of Sumerian type. The older remains also included a brick of a different type from any previously seen, interpreted to show that in the early age of mixed culture "Ur was not

[1] Sir Leonard Woolley, 'Ur of the Chaldees,' *Pelican Books*, 1938, pp. 18–21.

like al 'Ubaid, a village of mud huts and reed shelters, but contained permanent buildings solidly constructed, the town of a civilized people."

The 8-foot bed of clay was correlated by Woolley with the Flood of Sumerian history and legend, on which is based the story of Noah. In it was found an explanation of "one of the great puzzles of South Mesopotamian archaeology, the sudden and complete disappearance of the painted pottery which at one time seems to have been universally distributed over the southern sites." The older people who made the painted pottery and who

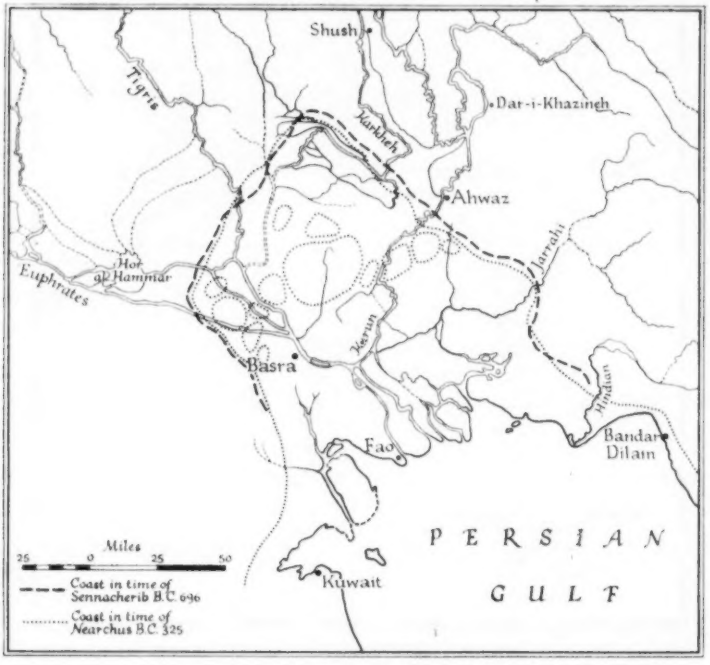


Fig. 2. The former extent of the Persian Gulf according to de Morgan

were wiped out by the flood are thought to have lived in low-lying villages. The early Sumerians who survived the flood are considered to have been city dwellers, living at a level to which the flood waters did not reach; after the flood they were thought to have been able to develop their own civilization uncontaminated, and to advance northwards and occupy the lands depopulated by the flood. Thus the Sumerians "who according to their own traditions were originally but settlers on the sea coast of the Persian Gulf, are found when history opens to be masters of the delta for a distance of 200 miles from the sea."

In our opinion the evidence is insufficient to justify such a generalization. We have seen similar instances of local flooding, at Dar i Khazineh and Old

Basra for example, but it is unlikely that such floods were synchronous. We shall describe present-day flooding south-east of Az Zubair and there is historical evidence that the great Hor al Hammar marsh between Ur and Basra only came into existence in about 600 A.D. Floods in Mesopotamia are endemic rather than exceptional.

The geological history of the "sunkland" of Iraq and the Persian Gulf

The plains of Iraq and the Persian Gulf occupy a zone in which gradual subsidence has been taking place during the concluding episode of the mountain building movements of Iraq and south-west Persia. This mountain system has developed out of a broader zone of depression or geosyncline, by a relative approach between central Persia and the stable massif of Arabia which compressed the mobile strip between and formed a series of giant earth waves or fold mountains. The time of maximum tangential movement was in the late Pliocene but the elevation of the mountain belt as a whole, as distinct from individual fold movements, continued into Recent time and is in fact still active. Complementary with the rise of the mountain strip there

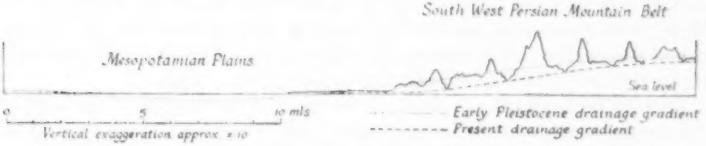


Fig. 3. Diagrammatic section to illustrate Recent earth movements

was further depression of the zone of subsidence, into which were carried the products of the erosion of the mountains.

The history of recent movements of the mountain zone is told by terraces in the river valleys leading from the plains into the mountains. The broad upwarp of the mountains was not uniform but episodic; after one phase of active uplift there was a long pause, during which the river systems eroded their channels to a state of maturity and extensive plains were formed, until a fresh movement rejuvenated the river gradients. At one time the rivers from the central plains of Persia, now at heights of 4000 to 5000 feet above sea-level but then at perhaps half this figure, flowed through matured valleys to reach the Mesopotamian plains or the Persian Gulf. Subsequent upward movement caused the rivers to cut actively into their mature beds, leaving river terraces or isolated plateaus as evidence of earlier regimes (Fig. 3).

It is important that the events of the Recent [1] history of the Mesopotamian plains should be understood, as the dominant motive is subsidence. It is not just that a static depression is being filled by river sediments; it is the long continued subsidence which allows the sedimentation to continue. In addition to the broad and dominant downwarp there may also be local depressions caused by slight synclinal movements between anticlines which are still being gently folded. The geological evidence of the Recent history of the "sunkland" of Iraq would seem therefore to point to continuing depression,

[1] In the geological sense, "Recent" extends backwards in time long before recorded history.

and this is the simplest explanation of the extensive marshes. The suggestion of de Morgan had seemed feasible when little was known of the regime of the rivers and of recent movements. The theory of continuing forward building of the land at the head of the Persian Gulf by river sediments depends on an assumption of static conditions in the rock floor of the zone of depression. If subsidence is still active, the advance or retreat of the sea must depend on which factor is the more active, sedimentation or sinking, and only firm and positive evidence can decide the point. The classical geographers were unfortunately not sufficiently precise in their descriptions and a further difficulty arises from the assumption that because a city has been described as a seaport it was necessarily on the coast; in reality this may mean only that it had river access to the sea.

A further factor which may have affected the early geography of the "sunkland," though before recorded history, is the general rise of sea-level resulting from the melting of the great ice sheets at the end of the Glacial period. This rise may have amounted to about 300 feet, and Holmes has stated that in consequence "the bottom of the Persian Gulf must then have been a fertile plain, floored with alluvium from the united waters of the Tigris and Euphrates." [1] Early Stone Age man must have been witness to these great changes, but the rise of sea-level from this cause had in all probability already expended itself before the time of the earliest organized civilizations of Iraq.

Looking farther back through time for clues to the position of the head of the Persian Gulf, there is no evidence of its having been north-west of its present limit since the early Pliocene. Pliocene and Pleistocene marine sediments are widespread along the Persian coastal strip between Bushire and the mouth of the Gulf, but farther north-westward the Pliocene sedimentation was in fresh-water lakes. Buff silts and sands similar to the alluvial deposits of the plains and marshes of the present day were deposited in great thicknesses, amounting to many thousands of feet, as subsidence continued to keep the great marshes in existence as settling tanks for the river sediments.

There is no simple development of recent marine terraces in the surroundings of the Persian Gulf because the folding movements of the anticlines which bound the coasts are still active. There are many sectors of subsiding coast with drowned valley conditions in synclines, and many sloping terraces on the flanks of adjacent anticlines. A possible exception to this generalization is a sector of the coast in the north-east corner between Bandar Dilam and Hindian, where there is a young raised beach about 25 feet above sea-level; but this may also be due to local movement.

The lakes and marshes of Iraq and their relation to the silt burden of the rivers

A glance at a good small-scale topographical map of Iraq shows that the plains are relieved at intervals by shallow lakes and areas of marsh (Fig. 1) arranged in a way which, to a geologist, is suggestive of basins produced by synclinal subsidence. The explanation that these areas have been cut off by the advance of the Tigris and Euphrates, and protected by the natural levees of these rivers from receiving sediment, is unsatisfactory. Not only does an appreciable amount of silt reach them during times of flood, but they must

[1] A. Holmes, 'Principles of physical geology,' London, 1944, p. 417.

constantly be receiving wind-blown material. Anyone with desert experience will agree that a tenth of an inch would be a cautious estimate for the amount of dust which could be immobilized in a year by a wet marshy area, and even this amounts to 8 feet in 1000 years.

The Euphrates has an average silt content at Ramadi (at a point near the surface of the stream at the centre of the river) of 553 dry grammes per cubic metre and the average discharge of the Euphrates at Hit throughout the year is 710 cubic metres per second. Corresponding figures for the Tigris at Baghdad are 787 dry grammes per cubic metre and 1240 cubic metres per second.[1] Assuming a specific gravity of 2 for the compacted silt this gives $76{\cdot}2 \times 10^7$ cubic feet of silt per year as the annual burden distributed by the combined rivers; spread out over 100 square miles it would have a depth of 3·28 inches. As the silt content in other parts of the river would be considerably greater than at the centre of its surface (average figures are being used for flow) this rate of accumulation can be regarded as a minimum only. It has been estimated that the Karun carries down 1·1 million cubic yards of silt every year, which is equivalent to 0·13 inches spread over 100 square miles. The Karun silt is carried into the Persian Gulf but the silt of the Tigris and Euphrates is deposited in the extensive marshes into which their flood waters flow. The amount of silt carried to the sea by the Shatt al Arab is such a small proportion of the total that it can be neglected in these calculations.

The area of the lakes and marshy areas over which the Tigris and Euphrates can distribute silt is about 1500 square miles, so that if all the silt burden of these two rivers was deposited in them, its minimum average thickness would be 0·22 inch per year. The actual amount of silt distributed annually may be much greater and, taking windborne silt into account, it would seem that these marshes and lakes could not survive more than a few hundred years unless they were rejuvenated in some way.

The Kharkeh river has been excluded from the above discussion, because it terminates in the Hawiza marshes which must absorb the greater part of its silt burden. It seems equally certain however that the Hawiza marshes could not survive for a long period without subsidence.

Le Strange [2] has described how the great swamp of Iraq was formed at about the end of the fifth century A.D. during the reign of the Sassanian king Kubadh I. "In his day the dykes existing along the Tigris channel, as it then ran, having been for many years neglected, the waters suddenly rose, and pouring through a number of breaches, flooded all the low-lying lands to the south and south-west." During the following reign the dykes were partially repaired and the lands brought back into cultivation, but in about 636 A.D. "the Euphrates and the Tigris again rose, and in such flood as had never before been seen. Both rivers burst their dykes in innumerable places, and finally laid all the surrounding country under water."

Changes at the head of the Persian Gulf within the last 100 years

On comparing the coastline at the mouth of the Shatt al Arab as shown on an old Admiralty chart of 1825 (corrected up to 1857) with the current chart

[1] M. G. Ionides, 'The regime of the rivers Euphrates and Tigris,' 1937.
[2] G. Le Strange, 'The lands of the Eastern Caliphate,' 1905, pp. 26, 27.

(No. 1265, which is corrected to 1942), it will be seen that the main change is a shift of the channel of the Shatt al Arab to the north-east. The old channel which was directed more or less straight to the south-east from Fao (Manamah on the old chart) has now completely silted up, several miles of it having been replaced by cultivated land, and the present channel follows a northern branch. The actual increase of dry land is confined to Ras al Bisha, east-south-east of Fao, and there does not appear to have been any great change in the general area of the mud flats on either side of the channel. In terms of "delta advance" this is a small achievement for eighty-five years. It is interesting to find clear evidence in air photographs of older courses of the Shatt al Arab on the alluvium of the south bank below Abadan, some of them several miles from the present river, and it is clear that the river has for a long period, historically, had a tendency to migrate to the north-east. It seems reasonable to associate this with the development of low terraces higher upstream (see below).

The most remarkable change revealed by the two charts is the silting up of a large area east of the mouth of the Khor Musa, south of Dera (Dara) Island and Ras Tanab (Fig. 7 on the folding sheet). On the old chart numerous lines of soundings with depths up to 9 fathoms cross this area; the new chart shows it all as mud which dries in patches at low water. The amount of sediment involved must be considerable, for the area of the new mud flat is about 60 square miles and the average depth of water in the area on the old chart was about 5 fathoms. Presumably the sediment has been brought down by the Khor Musa.

Recent relative movements in the Mashur and Khor Musa area

As the latest maps compiled from air photographs clearly show, the Bandar Shahpur tidal embayment has a characteristic shape different from most other parts of the coast. The general appearance is of a basin-shaped area well served with branching tidal creeks (Fig. 7). The basin has its long axis approximately west-north-west and south-south-east, and is connected with the Gulf by the sinuous Khor Musa channel, which bends through about 130° from west to south-east. Just over two miles south-west of Bandar Shahpur, the modern chart records a low water depth in the channel of 38 fathoms,[1] and depths of 20, 38, 25, 23 and 25 fathoms are shown in the channel from 1 mile to 5 miles south-west of Bandar Shahpur. Farther down stream the only conspicuous deeps recorded are 31 fathoms at the mouth of the Khor Wastah, and 20 to 29 fathoms near the mouth of the Khor Qanaqeh. South of this, depths get progressively shallower and the next 20 fathoms record is at least 60 miles south-west in the Gulf. It has been customary to explain the exceptional depth of water in the Khor Musa as the result of tidal scour, but this leaves unexplained the presence of the tidal embayment without which there would be no tidal scour.

A study of air photographs shows that Mashur is situated on the eastern side of a large deltaic fan (Fig. 7), the central line of which runs slightly east

[1] Captain K. Pollock, until recently Senior Harbour Master at Bandar Mashur, reports that 50 fathoms has been recorded.

of north from a point about 7 miles north of Bandar Shahpur; from this line long "fingers," which appear to represent old aqueducts, fan out to south-east and south-west, each with a herring-bone pattern of minor distributaries branching from it. Whether this delta is entirely artificial or whether the irrigation was based on a natural channel is not known, but it seems most improbable that any of the minor distributaries could have been completely covered by the tide when in use. It is therefore important to find that some of the old aqueducts now project as much as 2 miles into the tidal area and that the pattern of the minor distributaries is clearly revealed below high-water mark, sometimes as much as a mile out. The only reasonable explanation is that a slight subsidence has occurred in the area, either as a result of the compaction of sediments, the breaking of a bund, or earth movements. Of bunds there are no signs.

It would seem from the air photographs that the Mashur delta sheet was deposited by the Jarrahi (Marun) river before it was deflected westwards into

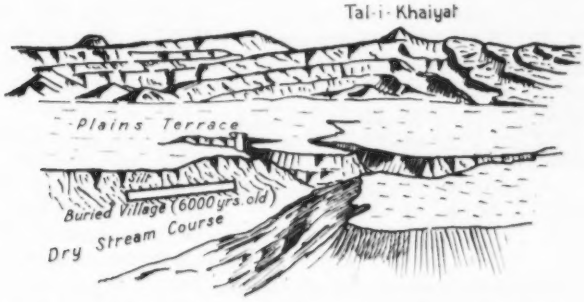


Fig. 4. The site of the buried village near Dar i Khazineh

the Fellahiya marshes. At the present time the land surface slopes gradually up from high-water level near Mashur to the Jarrahi, in which the water-level is normally about 15 feet below bank level, and in times of flood about 5 feet below bank level.

In former times a number of canals, navigable for small vessels, linked the present Khor Dhorak, which now enters the Khor Musa at Bandar Shahpur (Fig. 7), with the Karun south of Ahwaz; one of these canals which was of considerable size left the Karun at Kut Abdullah. Writing of them in 1846 Sir A. H. Layard [1] said "The beds of these canals are now much elevated above the river, even when that stream is highest. They must, therefore, have been supplied with water by artificial means, or the bed of the river must have greatly deepened since their formation." Layard inclined to the belief that in all probability the river had deepened its bed, and this would imply a relative uplift of the land with respect to sea-level. Recently the writers have seen, from the air, flood water draining into the Karun river in this area.

[1] Sir Henry Layard, *J.R.G.S.* 16 (1846) 54.

Ancient village sites at Dar i Khazineh

An old village site at Dar i Khazineh (10 miles south-east of Shustar and 10 miles south-west of the oil-field of Masjid i Sulaiman, see Fig. 2) has recently been investigated by R. A. Harmer and A. N. Thomas who have kindly allowed us to publish their results. Their observations provide most important evidence on relative movements during the past 6000 years. The site is close to the emergence of the first outcrop of the Upper Fars sandstones, which form a range of low hills (Fig. 4), and several layers of silt and sand, with old village floors, are exposed in the vertical bluffs formed by the recent dissection of the alluvial terrace by the small tributaries of the Karun.

The highest of the archaeological finds are some seven to eight feet below the top of the terrace and other finds, apparently including several floors, range downward for about ten feet from the highest occurrence (Fig. 5). The finds include flint and copper implements, and primitive pottery with painted designs which tend to be geometrical and include the swastika emblem. The pottery is good light buff ware painted in black with traces of red, or with a weathered black or greenish appearance. These fairly advanced designs and colours are referred by R. A. Harmer to pre-Susa I (about 3000–4000 B.C.) and an "alabaster" bowl and sherds have been dated by Professor Ghirshman of the French Archaeological Mission as about 3000 B.C.

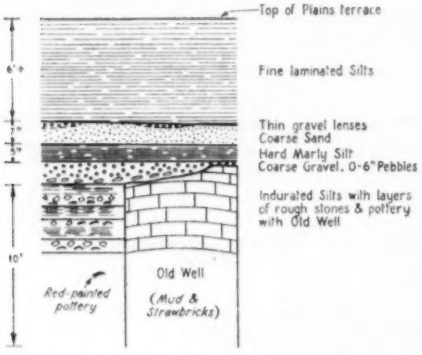


Fig. 5. Detail of the section at Dar i Khazineh

The site must have been in occupation for many years, perhaps thousands, during which the level of the alluvial plain was built up in successive layers to at least 10 feet. The next event was that the site was made untenable by floods; it was first eroded, as is proved by the deposition of sherds in layers showing a "water washed" appearance, and then coarse river gravels with a basal layer of pebbles were laid down to a depth of 6 inches on the eroded surface. This was followed by 5 inches of silt, and then 7 inches of coarse sand and thin gravel lenses representing a winding river course. These fluvial deposits are overlain by 6 feet of fine laminated silts containing *Lymnea*, which suggests a lacustrine environment. The upper silt layer remained the surface level of the alluvial plain for an extended period; for there is evidence of small settlements in Sassanian times in the fragments of pottery scattered over the surface of the ground.

The next great event was a rejuvenation of the Karun system caused by a renewed subsidence of the plains to the south-west, or by a tilting of the hill country to the north-east, or probably by a combination of both. The increased gradient of the rivers caused them to trench into the alluvial deposits

which had been accumulating during the still-stand period, and the alluvial plains on which the Sassanian remains (about 200 A.D.) are found were incised to a depth of 17 feet. It is not certain that this rejuvenation is entirely post-Sassanian as these settlements may have been established after the rivers had commenced their downward cutting; but the main facts are that between about 3000 B.C. and the present day there was first a build-up of the land surface by sedimentation to about 8 feet, and that this was followed by an entrenchment of the rivers by 17 feet. The south-western extension of the earlier plain has been removed by erosion, and the remains of any earlier habitations, on its surface or entombed within its silts, have been scattered and lost.

It would be unwise to generalize too widely from this extremely interesting and important evidence of relative movement. It is possible that it may be a local effect, due to the impounding of a local lake by a temporary barrier or to recent movement of the Naft Safid anticline to the north-east, but there is similar evidence of recent movement elsewhere, as in the entrenching of the lower reaches of the Karun already mentioned. The Dar i Khazineh evidence requires support from as many other similar localities as possible and we hope that further finds will be made. It is possible, for example, that the 8 feet of silt covering this site might be correlated with the cover over the 3000 B.C. remains at Ur described by Woolley, but at the Dar i Khazineh site it cannot be supposed that the local flood was in any way catastrophic to the inhabitants, for the village was only a mile or so from higher ground which was not covered. The site was probably at the edge of a marsh, and the succession of floodings prior to the final one show that periodic floods were the rule rather than the exception.

Recent movement of the Shaur anticline

The Shaur anticline forms a range of low hills emerging from the alluvial plains between Shush and Ahwaz (Fig. 2). The oldest rocks exposed are sands and silts of the Upper Fars–Bakhtiari series of Pliocene age and the folding movement which formed the anticline is late Pliocene and Pleistocene. Erosion kept pace with the rise of the anticline and levelled off the upturned beds to produce alluvial flats on their flanks and in gaps across the centre. The Sassanians cut two canals across the anticline to reach the fertile plains on the south-western flank, and these canal alignments afford a unique opportunity for measuring the uprise of the anticline since they were built; that is during the past 1700 years or so. One canal (Plate 3) still carries water but where it crosses the anticline it has cut down about 12 feet below its original bed; that is to say it has had sufficient excavating strength to offset the slow rise of the anticline. Either the more north-westerly canal which was tunnelled through the low ridge had not so strong a flow, or its maintenance was neglected, and it has been abandoned. A survey along its alignment shows however that on the anticlinal axis the bed of this canal has also risen above the level on the upstream side (Plate 4) by about 60 feet in $2\frac{1}{2}$ miles.[1]

Throughout much of the foothill area of Persia and Iraq the attitudes of

[1] Measurements, in February 1951, by L. H. Tarrant and W. Jones, of the Anglo-Iranian Oil Company.

terraces and drainage patterns indicate similar recent movements of individual anticlines, but this is the only case in which the rise can yet be dated.

The Zubair tidal embayment

In February 1946, during a flight from Basra to Kuwait, one of us (G.M.L.) observed old irrigation canals running out into the tidal embayment area of the Khor Zubair and a subsequent examination of air photographs confirmed the observation (Plate 1). In the north there are two old canals, one running south-east from the Hor al Hammar and passing Az Zubair on the east, the other running south-east from the Shatt al Arab about 10 miles west of Khurramshahr. The two canals unite 15 miles south-east of Az Zubair and continue south-east as one canal to disappear below the alluvium east of the Khor Abdullah. The tidal drainage of the Khor Zubair cuts right across these old canals and the general shape of the embayment and the tidal distributaries is very similar to that in the Khor Musa area.

Between the Shatt al Arab and the tidal embayment is a wide area of formerly, but now abandoned, irrigated country presumably dating from Abbasid times (758–1258 A.D.), the old irrigation pattern being clearest in the north-west along the Shatt al Arab. To the south it gradually disappears beneath the alluvium, various outlying relics showing conclusively that it formerly had a much greater extension. It is impossible to avoid the conclusion that more than 100 square miles of former irrigation has been put out of action. As no system of bunds is visible the breaching of which might have contributed to the submergence, and as tidal scour unaided could not have achieved it, it is necessary to assume that a slight subsidence has taken place in the tidal embayment area. The main facts are illustrated in Figure 6. At the present day, with high tides and southerly winds, the tidal water laps at times against the Basra–Zubair road embankment, and a bund has recently been made to protect Basra from these marine inundations.

Relative uplift between Khurramshahr and Basra

It will be seen in Figure 6 that the northern boundary of the area of old irrigation work is sharply demarcated from the alluvial area of the Shatt al Arab which is now under cultivation, yet the map was prepared by a draughtsman who had not been instructed how to draw this particular line. The geologist will immediately see in it a terrace feature, cultivation being now confined to the present normal tidal flood plain of the Shatt al Arab and the old irrigation works usually lying on a terrace a few feet higher up. A stereoscopic examination of air photographs confirms that the northern boundary of the old irrigation work is sometimes marked by a low cliff.[1] Elsewhere the photographs suggest that there is no difference in level, and in one place the modern irrigation pattern crosses the old. At Qarmat Ali, on the north-west outskirts of Basra, air photographs show two of the canals which must formerly have distributed water to the old irrigated country on the

[1] This low terrace feature has recently been confirmed on the ground north-east of Basra. In order to extend the area of date cultivation the peasants excavate the terrace to about 3 feet, piling up the spoil in long ridges which may be 15 feet high; these ridges are much larger than those concerned with the normal maintenance of ditches on the present flood plain.

Plate 1. Old irrigation works breached by the sea **in Khor Zubair**

Plate 2. Old canals and modern cultivation at Qarmat Ali (see page 39)

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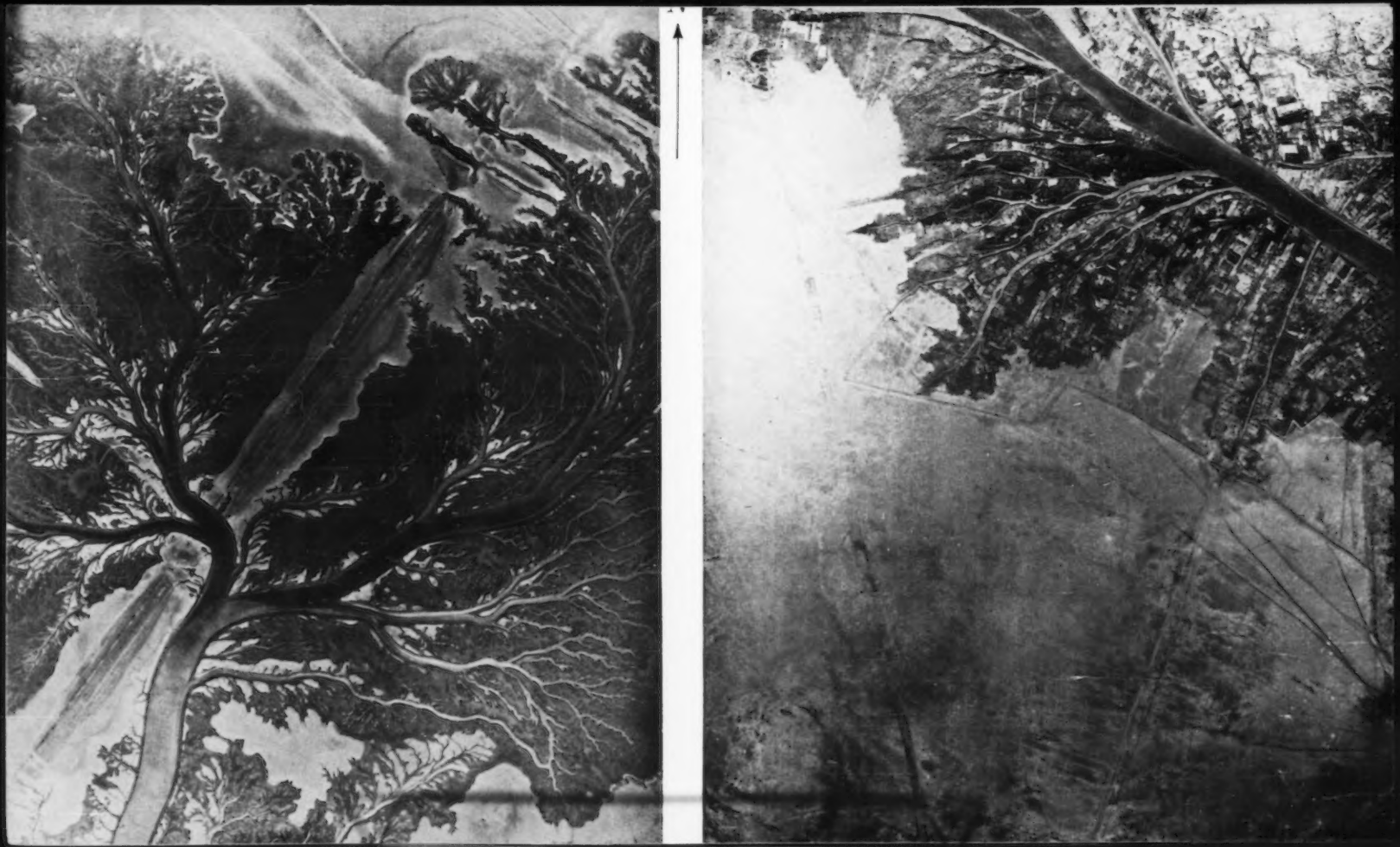

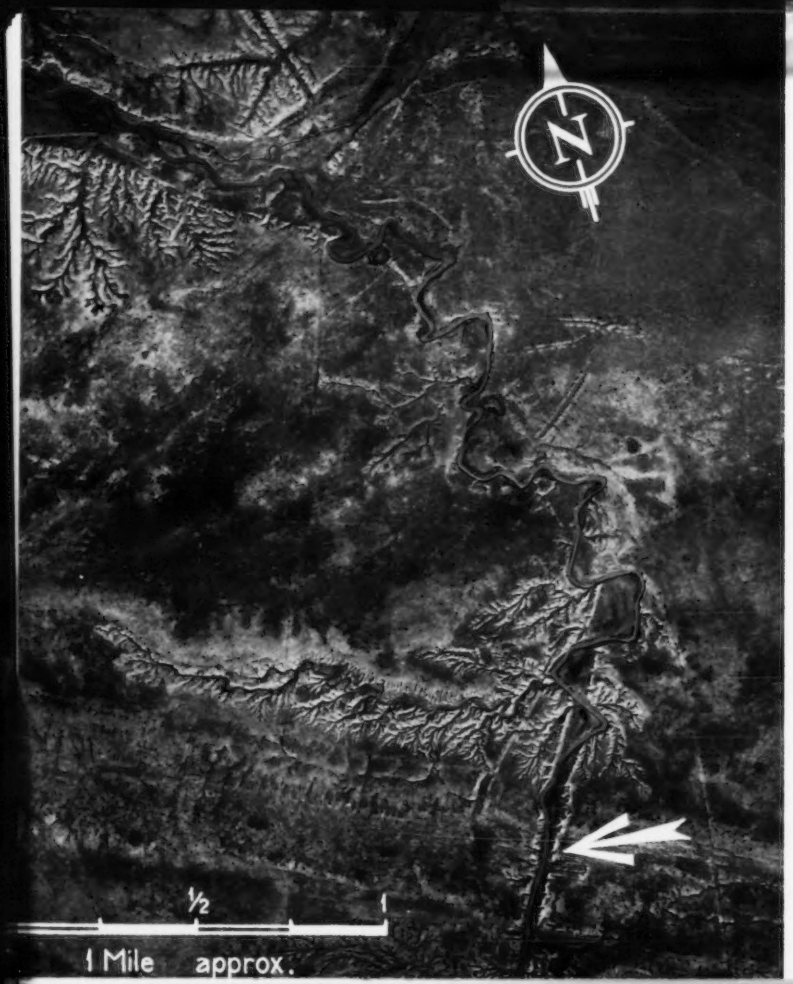
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south (Plate 2). A small difference in height between the alluvium at present cultivated and the older alluvium is here clearly revealed by the sharp boundary between them. This natural feature, which is only occasionally reinforced by bunds, shows the tidal distributaries gradually cutting back into the old alluvium. The old canals could not now be brought into use without deep excavation, and their size would appear to preclude a former water lift by artificial means; this again suggests a small relative uplift of the old alluvium with respect to the river since the Abbasid period. One of the possible reasons for this is the change in course of the Karun which took place after the cutting of the Haffar channel in Abbasid times. It seems reasonable to suppose that the extra volume of water flowing down the Shatt since the Karun forsook the Bahmishir channel may have increased the scour of the bed of the Shatt; this event may even be the cause of the terraces and recent movements of the river south of Abadan referred to above.

It will be noticed in Figure 6 that the old irrigation works are connected on the east with a system of distributaries. These too are now abandoned, but formerly they must have carried away much of the water from the irrigated tract to rejoin the main channel of the old Shatt al Arab nearer the sea. From this one may infer that the head of the Gulf was not very far away from its present position when these works were in use; it is even possible that it lay farther to the south-east than now.

Possible subsidence in Bubiyan island

Published maps give very little information on Bubiyan island, but air photographs show that the northern half has a tidal drainage system of the same type as the Khor Musa and Khor Zubair tidal embayment (Fig. 8). Moreover the area drains to the north-west, itself a most suspicious circumstance, and the southern end of the island seems to be increasing in area. It is also of importance to find a tidal distributary 3 miles long flowing north-north-west into the Khor Abdullah just south of Umm Qasr.[1] These features are most readily explained by assuming a tendency towards subsidence in the area south-east of Umm Qasr. Admiralty Chart 1265 shows that there are no depths of water in the Khor Zubair and Khor Abdullah comparable with those in the Khor Musa. Nevertheless the deepest recorded soundings are in the area where subsidence appears to have occurred (up to 10 fathoms at the north end of Bubiyan island and more than 7 fathoms in the Khor Zubair). In view of the uncertainties of tidal current action we would not attach much importance to this observation, but it may be of significance.

Evidence of recent uplift in the Zubair area

Recent geophysical work and bore-holes by the Iraq Petroleum Company in the Basra area have proved an axis of uplift trending north-north-west a little to the west of Zubair. In this and neighbouring areas the underground structure is to some extent related to the present topography and, to be wise after the event, it is easy to pick out the Zubair axis of uplift on an oblique air photograph; particularly to the west and south of Shu'aiba where the cultivated land of the Al Guraitiya valley shows up the complementary

[1] See Fig. 6 (only one mile of the distributary is shown).

Plates 3 and 4. Old canals crossing the Shaur anticline (*see page* 39)
Phots. Hunting Airsurveys, Ltd.

depression on the west. It is quite a normal geological occurrence for the axes of earth movements to move spasmodically throughout long periods of time and geologists are accustomed to study the drainage and topography of flat areas for clues to the underlying structure. The point here is that knowledge of the structure confirms that the Khor Zubair tidal embayment is likely to be a subsidence phenomenon, because the area coincides with a structural depression on the north-east of the Zubair axis of uplift.

The north-western old canal which is now being breached by the sea in the Khor Zubair embayment area can be traced back on air photographs to the Hor al Hammar, north-west of Zubair. Yet it would seem that only a very considerable amount of excavation would allow water to flow through it from the Hor al Hammar at the present day, even when the lake is at flood level. It therefore seems possible that recent uplift along the Zubair axis may also have played a part in causing the abandonment of the old irrigation works. The historical evidence for the formation of the Hor al Hammar marsh in about 600 A.D. has already been quoted.

The old site of Basra occupies an extensive area between Shu'aiba and the present town of Az Zubair and therefore on the flank of the Zubair axis. It was a flourishing city between 800 and 1200 A.D. and it has been described in considerable detail by Arab geographers. It is often referred to as a seaport, but while it had connecting canals with the sea via the Shatt al Arab, the course of the latter was then approximately in its present position. The ruins of the city form mounds of brick rubble at the edge of the flat plain and on the first slope of the marginal terrace towards Shu'aiba, and an examination of the terrace, which at its edge is about 12 feet high, shows that it is composed of gypseous sand, silt, and pebble beds containing occasional freshwater shells, the forms *Thiara* (*Melania*), *Batissa* (*Corbicula*) and *Unio* having been identified by Dr. F. E. Eames. No marine shells were found *in situ* to indicate a marine terrace; three small loose pieces of a young marine shelly limestone were indeed found among the brick rubble of old Basra but the presumption is that they were transported. The yellow brick and pottery rubble of old Basra is abundant on the surface along the edge of this terrace but, surprisingly, there is a lower level within the terrace material of brick and pottery of very similar aspect, about 3 feet from the surface and 3 feet 6 inches in thickness. A still earlier Basra would seem to have been covered by flood and alluvium, but no clue to the interval in time which separates Basra I from Basra II is forthcoming. The area would repay a more detailed investigation.

Fossil evidence from the alluvium

Although numerous wells and bore-holes have been put down for various purposes in the Mesopotamian plains, very little attention has been given to the fossil content of the alluvium. It is always difficult, without expert knowledge and local experience, to be certain whether fossils recorded by early travellers were actually *in situ*, or whether they had been washed into the alluvium from neighbouring rocks—or even in some cases brought in by animal agencies (including human beings). Caution must be therefore exercised before such evidence can be safely interpreted in terms of marine or fresh-water conditions of sedimentation. This is particularly true of the hard

parts of smaller organisms, such as foraminifera, which can be carried long distances by currents. It is to be hoped that this note will encourage further work in this field.

Confining ourselves to evidence which is new and acceptable, we find that the few available facts support our hypothesis of local marine inundations due to subsidence.

Dr. W. A. Macfadyen, to whom we are indebted for allowing us to refer to unpublished work, has found the marine foraminifera *Buliminella*, *Streblus* and *Triloculina* in alluvium at Amara, 95 miles north-north-west of Basra, ranging from a depth of 3 feet to a depth of 35 feet below the present level of the bed of the Tigris (stated to be 10 feet above sea-level). At Qurmat Ali on the north-western outskirts of Basra, samples of alluvium from 2 feet and 16 feet below ground level contained a mixture of marine and fresh-water organisms (marine—*Bolivina*, *Discorbis*, *Elphidium*, *Eponides*, *Globigerina*, *Lagena*, *Nonion*, *Quinqueloculina*, *Spiroloculina*, *Streblus*, mollusca and some echinoid remains; fresh water—*Chara* and *Centropyxis*), whereas samples from 10 feet, 56 feet and 64 feet below the surface produced only marine organisms (*Massilina*, *Quinqueloculina*, *Spiroloculina*, *Streblus*, polyzoa and mollusca). A mixture of marine and fresh-water organisms was also recorded by him in mud from the Arbat creek at Basra (marine—*Cornuspira*, *Elphidium*, *Lagena*, *Nonion*, *Quinqueloculina*, *Streblus* and mollusca; fresh water—*Difflugia*, *Chara* and plant seeds).

Recent bore-holes drilled by the Iraq Petroleum Company in the Nahr Umr area, 20 miles west-north-west of Basra, have proved 90 feet of alluvial clay and sands, with fresh-water shells at the base, resting on bed rock of Miocene age. This evidence, in conjunction with that obtained by Dr. Macfadyen, conflicts with the normal deltaic advance theory of de Morgan and suggests that the area has subsided some 90 feet, and fast enough to allow an incursion of the sea to take place. If it is assumed that the average deposition of sediment is a quarter of an inch in a year, this represents a period of 4320 years; on this line of reasoning the area might have been dry land in Sumerian times, and the alluvium underlying the Lower Tigris marshes may conceal many old city and village sites covered by the silt laid down during a long period of inundation.

Samples from bore-holes in the Mashur area, to a depth of 200 feet, have been examined by A. N. Thomas who reports fresh or brackish water conditions with ostracods, *Chara* seeds, *Melania*, etc., from the surface to a depth of 20 feet; at 60 to 80 feet *Rotalia beccarii*, indicating estuarine or marine conditions; and at 120 feet a typically marine fauna with *Polystomella* (*Elphidium*), *Orbulina*, *Rotalia*, small lamellibranchs, etc. Shallow bore-holes at Fao have proved 20 feet of lightly consolidated marine silty mud, overlying 10 feet of slightly more consolidated sediment in which a few fresh-water gastropods occur with the marine organisms. These gastropods could have been washed in from neighbouring fresh-water sediments, but on the normal delta advance theory they would have been expected in the upper rather than the lower part of the alluvium penetrated. Recent bore-hole samples of alluvium below sea-level, about 25 miles south of Dizful and 20 miles south-east of Ahwaz, have not revealed any marine organisms.

Any simple interpretation of the type of evidence cited above is complicated by some further evidence from Dr. Macfadyen who has collected shore sand from lake Abu Dibs, west of Karbala, and found it to contain marine organisms (abundant *Streblus*, few *Elphidium*) which suggest to him a relict fauna still living in the lake. Its surface is reported to be about 150 metres above sea-level.

The age of such assemblages of foraminifera as those found by Dr. Macfadyen at Amara cannot be determined more closely than that they are Recent in the geological sense, but this straddles the whole span of human evolution and no guidance for more exact dating is possible from palaeontology. Fortunately a new and apparently precise method is now being developed which may allow the Amara shells to be dated (as say 3000 B.C. or 10,000 B.C.) with an accuracy of perhaps 250 years. This is the radioactive carbon method and depends on a determination of the proportions of the isotopes C^{12} and C^{14} in any organism which has incorporated carbon in its structure. The isotope C^{14} is unstable, with a half-life of 5600 years. The method has recently been described and the results discussed by F. E. Zeuner.[1]

Conclusion

The Mesopotamian plains are the birthplace of some of our oldest civilizations and abound in human interest. Hitherto Babylonian legend and very imprecise accounts by historical geographers have been the mainstay of reconstructions of physical changes of land and sea, but new evidence is gradually being accumulated from well-directed archaeological excavations, from bore-holes, from physical and geological observations, and from aerial photography. A vast amount of research to coordinate all these lines of evidence is required before a reasonably accurate picture of the prehistoric geography can be drawn. The observations set out in this paper are however sufficient to show that the older archaeological theories are based on an unjustifiably simple assumption. The Tigris, Euphrates and Karun rivers are not building forward a normal delta; they are discharging their load of sediment into a tectonic basin which is the successor to a geosyncline in which many thousands of feet of sediment have been accumulated in the past, over a period to be measured in hundreds of millions of years. The balance between subsidence and sedimentation in the recent past seems to have been finely poised; subsidence was episodic and in the intervals the depressions tended to fill up with sediment. But in general subsidence has been dominant, with the exception of some minor local uplifts representing a late movement of anticlinal structures. We have described the evidence at Dar i Khazineh where, in the course of the last 6000 years or so, there has been a build-up of surface level of 8 feet followed by a rejuvenation of the river system causing the erosion of the earlier surface to a depth of 17 feet.

Geologically therefore, one can visualize a whole sequence of "floods," not necessarily catastrophic in pace, but certainly catastrophic in eventual result. One such "flood" south-east of Zubair has caused the inundation

[1] F. E. Zeuner, "Archaeological dating by radioactive carbon," *Science Progress*, April 1951, pp. 225–238.

by the sea of a large tract of once fruitful land, but as the irrigation canals had been abandoned the progress of the subsidence has passed unnoticed.

We hesitate to suggest a position for the head of the Persian Gulf at the time of the Flood which gave rise to the Babylonian legend, for it is equally impossible to hazard a guess at the date or the extent of this event. There is no acceptable historical evidence that the head of the Gulf was ever very far up-country from its present position, and the evidence which we have collected suggests on the contrary a complex pattern of advance and retreat of the sea; precise dating is not yet possible. Subsidence of the Gulf bottom combined with a rise of the sea-level may even have buried the remains of many cities below river-borne sediment or below the waters of the Persian Gulf.

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Notes on illustrations

Plate 1. Old irrigation works breached by the sea south-east of Zubair. The location of this photograph will be seen from Fig. 6 on the folding sheet.

Plate 2. Two old canals branching off from the Shatt al Arab at Qarmat Ali, north-west of Basra. There is clearly a small difference of level between the modern irrigated alluvium and the desert, in which old irrigation works are visible. The old canals could not now be used without deep excavation and artificial water lift.

Plate 3. An old canal course across the Shaur anticlinal axis; now followed by a stream which, at the point indicated, is about 12 feet below the old canal bed.

Plate 4. An old canal across the Shaur anticline which was carried below the highest part of the ridge by a tunnel (*kariz*). Note the stream course, at the point indicated, flowing into the canal towards the north; the flow in the canal was originally towards the south.

Fig. 6 (on folding sheet). The symbol —·— in the Shatt al Arab area denotes the limit of present irrigation; = = = denotes a road or track.

Fig. 7 (on folding sheet). The stippled areas are between high- and low-water marks. Note that the fans of old irrigation channels in the Mashur area extend as much as two miles below high-water mark. The area at present under irrigation lies farther to the west (mostly off the map).

Fig. 8 (on folding sheet). This is adjacent to Fig. 6, Al Warba island appearing on both maps. The dotted lines at the south-eastern end of Bubiyan island are old strand lines.

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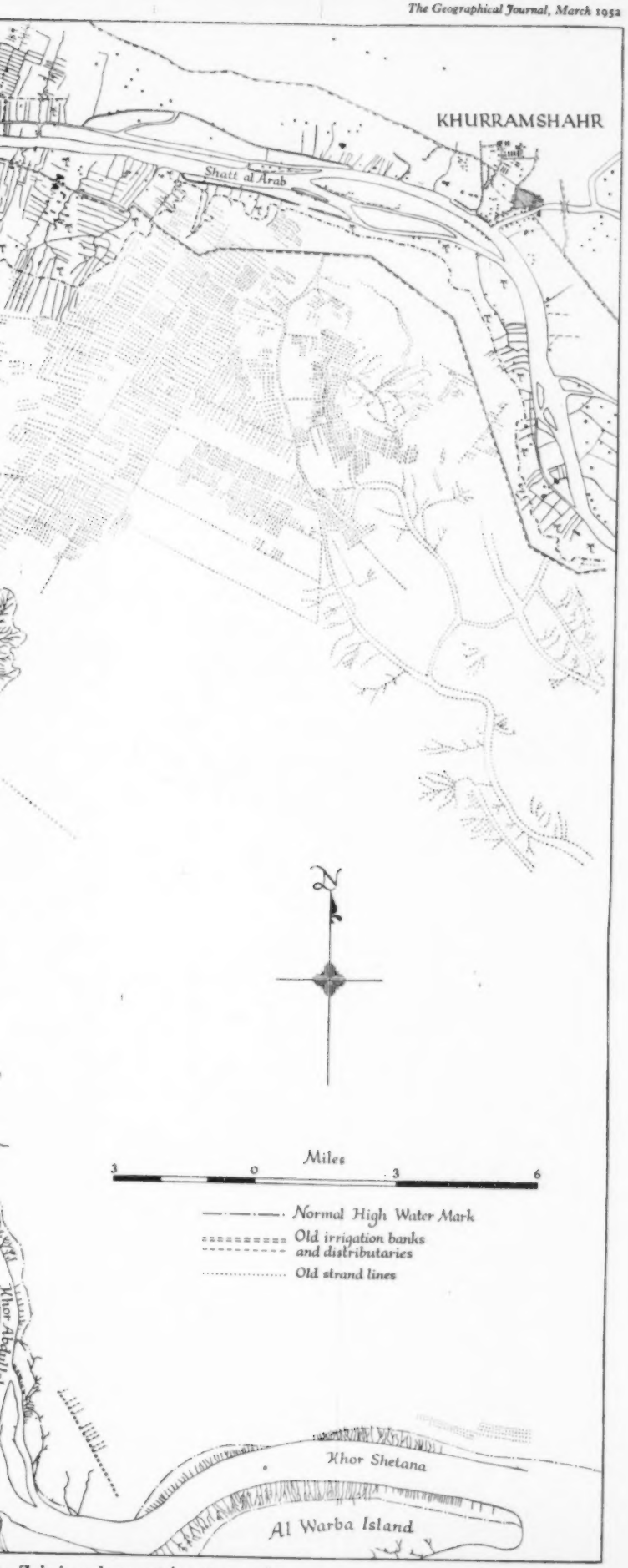
Fig. 6. The Zu



e Zubair embayment (see page 39)

Lees and Falcon

FINNISH KARELIA: AN INTERNATIONAL BORDERLAND

W. R. MEAD

IN 1850 THE Royal Geographical Society was addressed for the first time by a Finn—the Arabian explorer, G. A. Wallin, who recounted his experiences in the *terra incognita* of the Middle East. Ironically enough, his own north-eastern homeland was equally little known to the England of his time. Today, Finland is far from unknown in Great Britain; but its component parts are still not clarified in our geographical works and no part is more worthy of attention than Finnish Karelia, the most divided province of a much divided land. This fact of division once prompted a Finn to remark "We are a little Balkanised." To him a location—albeit northern—along eastern Europe's unstable borderland raised problems similar to those of the Balkan countries. The constituent parts of Finland have been subordinated to the allegiance of neighbouring powers and their peoples have experienced admixture, displacement and the intrusion of alien cultures. The external impact has been most fruitful in the south-west, most fateful in the south-east. For this reason no understanding of Finland's past or present is possible without an appreciation of the south-eastern border of Karelia. Emphasizing the Balkan metaphor, a professor of history at Helsinki once described Karelia, colourfully and not inaccurately, as "the Macedonia of northern Europe." This paper discusses some of the issues which arise from its recurrent submergence,[1] for a detailed treatment of the character of Finnish Karelia and of its changing boundaries will throw into relief the nature and significance of the latest dispersion.

The character of Karelia

The first task is to define Karelia, for in the past it has lacked precise cartographical location. The name, entering written documents at least since the Novgorod Chronicles, had appeared on maps for four hundred years. It has ranged from east of Dwina, in Munster's *Cosmographia* (1550), to south of Kola, on Mercator's map of Norway and Sweden (1595); while Gastaldi (1568) duplicated it.[2] Finnish Karelia still suffers an uncertainty in cartographic outline, perhaps because Karelia is invested with different meanings by different people. In Figure 1 the western boundaries are taken from the 'Atlas of Finnish History' (Maps 21 and 22) and are acceptable in their north-western reaches; though they are challenged in the south-west by ethnologists of the Finnish Literary Society.

Finnish Karelia comprises five areas. They are the isthmus, which Finns

[1] This paper is the first of three devoted to a study of Karelia and its displaced people. The second, "The cold farm in Finland," was published in the *Geographical Review* (41 (1951) 529–43).

[2] The variation is conveniently recorded in the series of maps accompanying C. Enckell, 'Karelens karta före Stolbova Fredsslutet år 1617,' *Nordenskiöldssamfundets tidskrift*, Helsingfors, 1942.

call *Karjalan Kannas*, Border Karelia (*Raja Karjala*) to the east of Lake Ladoga and, between the two, Ladogan Karelia (*Laatokan Karjala*) which is limited by a fiorded coast to the south and by Lake Saimaa to the north. At the meeting ground of Border Karelia and Ladogan Karelia is the town of Sortavala. The great northern lobe of Karelia (*Pohjois Karjala*) belongs to the lake plateau; west of the hinge of Viipuri, with the Gulf slope as background, is *Länsi Karjala* or western Karelia. Historical evolution has pre-

Fig. 1. The regions of Finnish Karelia

vented Finnish Karelia from becoming a contemporary administrative district. In independent Finland, it has been divided between Viipuri province (since 1944 replaced by Kymi province) and Kuopio province which, together with Mikkeli, was born of *Suur-Savo* (Great Savo), parent province of the Savo tribe. East of the political boundary is *Itä Karjala* or East Karelia. The lands between lakes Ladoga and Onega are sometimes defined as Aunus Karelia (*Aunuksen Karjala*) and those on the White Sea flank as *Vienan Karjala*.

Finnish Karelia is not a distinct physical unit and these five parts form no

coherent whole. The superficially uniform landscape continues westwards into peninsular Finland and eastwards into Russian Karelia. Only the trained eye of the specialist can detect, in the Karelian background, variety within the broader uniformity. Variety, born of solid rocks and drift deposits, emerges rather on the mosaic of the geological map than on the face of the land. Thus, north Karelia and border Karelia have a background of the oldest gneissose granites found in the Fennoscandian shield and, of all Finnish Karelia, are caught most completely in the net of morainic drift. Yet, visually, it is only the southernmost ridges of the Finnish fells which stand out. Migmatites and post-Bothnian granites[1] underlie Ladogan Karelia; while western Karelia is backed by the distinctive Rapakivi granites. Both subdivisions are masked by the eastern spurs of the Salpausselkä moraine; while on their coastal fringes, clay and silt embayments (almost invariably reclaimed for farming) are common. The only precise geological break is the zone of division between northern primary rocks and southern quaternaries which crosses the Karelian isthmus, linking Koivisto on the Finnish Gulf with Käkisalmi on Lake Ladoga. The low-lying isthmus, with its drainage extending the north-west and south-east pattern of the plateau waterways, bears a widespread and heavy burden of sand.

In so far as Finnish Karelia has a focus it is Lake Ladoga. Archaeologically and historically, the northern half of this great inland sea, with its tributary lake plateau drainage, has been central to Karelian life. From its varied coastline, generous with island groups, rivers like the Vuoksi in the west or the Jänis in the east have provided routeways to a broad back country. Admittedly the rivers were not navigable but, once their braided courses were negotiated, the lake ramifications beyond opened horizons two hundred or three hundred miles to the north.[2] Water has given access where land has obstructed; for Karelia has remained over a long period one of the most heavily wooded parts of Finland. Eighty per cent. of North Karelia and Border Karelia were described as wooded in the 1925 'Atlas of Finland' (Map 18). Save for the ecologist, this coniferous cover only strengthens the general impression of uniformity in the Karelian landscape and of scenic continuity east and west. The most detailed cartographic record from which many of these facts may be gleaned is the so-called economic map of Finland (*Suomen taloudellinen kartta*, 1 : 100,000), dating from the inter-war years. But such a map tells nothing of the winter which, through frost and snow, marries Finland at large, and Karelia in particular, with the continent. Winter, changing the summer lines of movement, reduces the significance of Lake Ladoga as the natural focus of the area.

Scattered across a Karelia which shows little physiographical distinction from the rest of Finland, is a group of people which has shared a certain ethnographic unity since at least the tenth and eleventh centuries A.D.[3]

[1] This land of granite has its own classification of granites.

[2] In medieval times Karelian control extended via Oulu valley to the head of the Bothnian Gulf cf. K. Vilkuna, 'Gränsen mellan Sverige och Finland i etnologisk Belysning,' Rig, Stockholm, 1951.

[3] Cf. A. M. Tallgren, "Les provinces culturelles finnoises de l'âge récent du fer dans la Russie du nord," *Eurasia Septentrionale Antiqua*, No. 3, 1928 and No. 12, 1938.

Variations in the degree of unity among the Karelians have been largely the result of outside forces. Thus, as a result of invasion and counter-invasion, isthmian and south-west Karelia have suffered population displacement and admixture. By contrast, the boundaries to the north-east of Lake Ladoga have swung to and fro without any physical impact of armies and the population, experiencing less direct interference largely because of physical detachment, has been more stationary. Records of migration and immigration confirm that, until the twentieth century, most people in Ladogan and northern Karelia continued to live and die in districts where they had been born.

The persistence of this group in the least accessible part of Karelia meant the retention and accumulation of a body of custom and culture upon which the emergent Finnish nation drew during the nineteenth century. It drew selectively, and there was no wholesale transference of Karelian characteristics. Neither the institution of the great family (*suurperhe*), with its several tens of members living in community, nor the Orthodox church experienced expansion. Dialects made no headway. Building forms, like the two-storied Karelian farmhouse with the animals below and the people above, were recorded as of ethnographic interest but were not copied. From the Finnish Literary Society's collection of folk lore and custom, song and dance; from the popularization of provincial foods and dishes, and the restoration of coats-of-arms and flags (the black and red of Karelia) were recreated the *légende* of the province. Viipuri, geographically eccentric to Karelia and in that part which retained fewest of the original Karelians, became its strong point.

The particular human stamp given to Finnish Karelia during this period was something new. Eighteenth and early nineteenth century travellers who traversed western and isthmian Karelia wrote of no Karelian individuality. This was partly because they never visited the real Karelia. It was the distinction between Swedish and Russian Finland which struck them. Thus Nathaniel Wraxall on crossing from the Swedish side of the Kymi river, found that at Frederikshamn "The features, complexion and dress of the inhabitants were all Muscovite and a thousand leagues of distance could not have made a more striking alteration"; of the land, he commented, "It is unpeopled, uncultivated and unfertile." [1] Sixty years later, the anonymous author of John Murray's first guide to Finland conveyed no distinct impression of Karelia. Here was an accurate observer whose summary picture of Finland was as good an account of that country in English as any published before John Scott Keltie's contribution to the ninth edition of the *Encyclopaedia Britannica* of 1879. "There is a striking difference," ran Murray's guide, "between the inhabitants of the Finnish provinces to the west and those to the east of Viborg. Beyond Viborg, you appear suddenly to be thrown among a strange people . . . almost as completely Russian as if you stood on the Kremlin at Moscow . . . Everything seems tamed down—the road becomes level and the wide plains spread their monotonous extent around you on all sides—the villages begin to look Russian, formed of a long straight row of wooden cottages, lining the road on either side with their gable ends all built exactly alike and all still and silent." Such " slight

[1] Nathaniel Wraxall, 'Tour of the northern countries,' London, 1774.

symptoms of the presence and industry of man" as there were probably sprang from the cosmopolitan element in western and isthmian Karelia, strung along one of the land routes to St. Petersburg and Russia. Generations of diplomats and merchants risked break-neck carrioles and sleighs on the Turku–Viipuri trunk road rather than sail the ill-charted inner Baltic. In Viipuri, they found traders of Dutch, British [1] and German extraction. Outside the fortress and bishopric there were alien features in the landscape. Baron Nikolai was laying out acres of parkland in the English style in his park at Mon Repos. Volumes of Repton and the *English Landscape Gardener* stood on shelves in a library which looked out upon virtually virgin forest. At Raivola plantations of the exotic *Larix sibirica* were maturing that Peter the Great's successors might have timber for men-of-war. These cosmopolitan elements on the south-western fringes of Karelia were eclipsed by the rise of provincial patriotism in the nineteenth century.

The distinction of Finnish Karelia was the greater after the First World War because it was adjacent to east Karelia. A hundred and twenty years ago, when Zacharias Topelius and Elias Lönnröt were collecting the fragments of *Kalevala*, there was no material separation of Finnish and Russian Karelia. As ideologies have sharpened, political boundaries have been incised. Beside this, in the 1930's, the Karelian Soviet Republic placed restrictions on the Finnish language and, in 1937, replaced the Latin by the Russian script. The intrusive Finnish army discovered in 1941–44 that east Karelia retained only the vestiges of ethnographic community with Finnish Karelia. Finnish persisted as the language of rural areas; but Russian dominated the towns. Social customs, farm practices (on such attenuated holdings as remained) and architectural design showed lingering affinities.

The allegiance of Karelia

Karelia as a changing concept springs not from disunity within, but from disagreement over the territory as an international borderland. To the definition of the area must be added an outline of the boundary changes which have differentiated it, and Figure 2 shows the successive advances and retreats of Russia in Finland [2]; the density of settlement at the time of the boundary changes being indicated by the density of ecclesiastical parishes. Ethnographic changes have accompanied these shifts in allegiance so that to Finnish-speaking Karelia have been introduced the Swedish and Russian tongues and the Latin and Russian scripts.

The first Swedish advance into Karelia was encouraged by the Papal Bull of 1255 and, in the last decade of that century, a fortress and Catholic bishopric were established in Viipuri. Simultaneously, the shores of Lake Ladoga became missionary territory for Orthodox monks. Valamo monastery, dating from at least the twelfth century, preceded the establishment of the four main church districts of Ladoga, Ingermanland, Aunus (Olonetz) and Arch-

[1] Cf. my paper "Thomas Dunn och Edward Spieker," *Finsk Tidskrift*, Åbo, January, 1941. Dunn's trading suffered obstruction when the natural hinterland of Viipuri was divided by new political boundaries.

[2] The year 1295 was the approximate date of division of control over Karelia; but it was not until 1323 that an actual longitudinal line was drawn, and not until 1595 did it assume the precise outline shown on the first map.

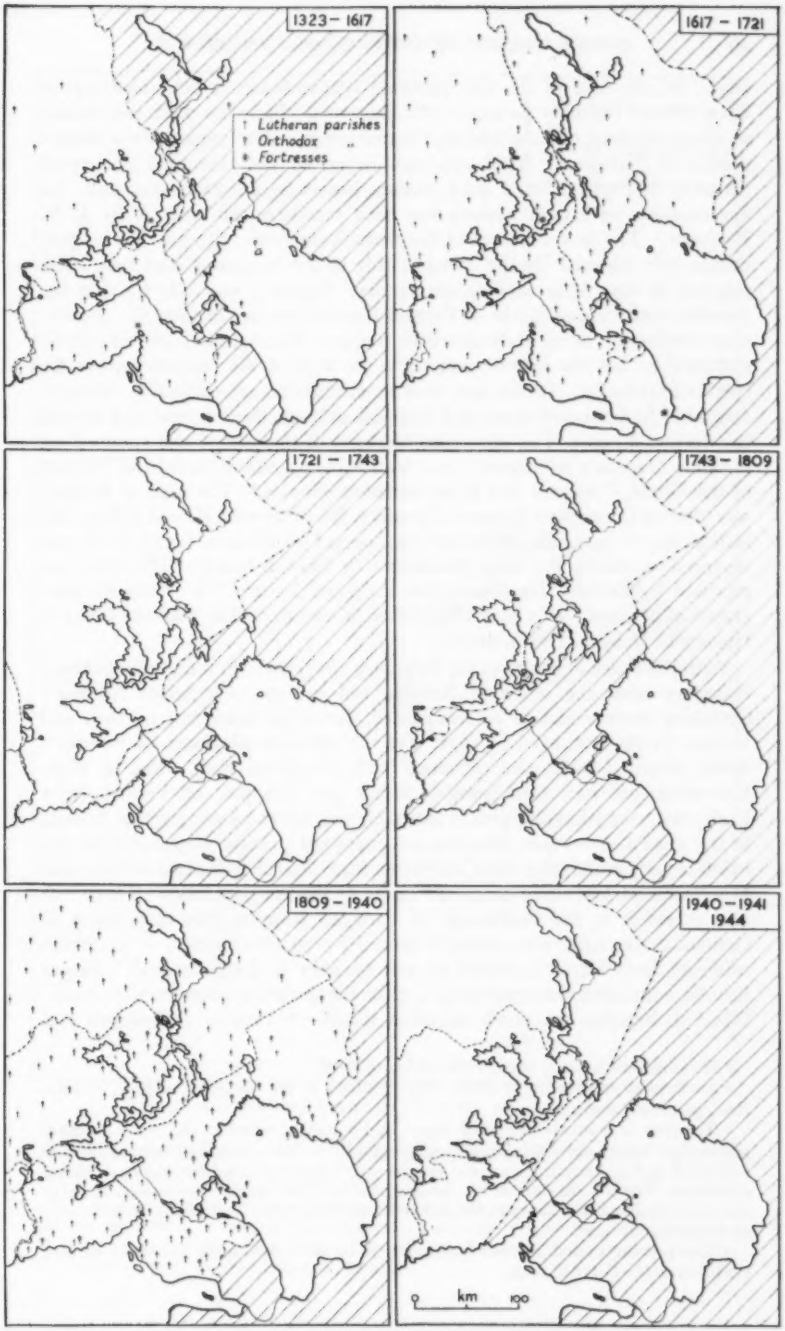


Fig. 2. The changing boundaries of Finnish Karelia

angel. By the time of the first partition (Pähkinäsaari or Schlusselburg) in 1323, seven Orthodox parishes with supported chapelries were established on the north shore of Lake Ladoga. A taxation record belonging to the Metropolitan of Novgorod, dated 1500 (published by the Historical Society of Moscow in 1851–2) listed 4000 peasant homes in the Orthodox area. An approximate settlement pattern has been reconstructed from it by J. V. Ronimus.[1] The land registers of Gustavus Vasa from 1539 provide roughly comparable material for the Swedish side of the boundary, and have been mapped in the 'Atlas of Finnish History.' Figure 3 sets side by side the Swedish and Russian halves of Finnish Karelia in order to show the population distribution in the early sixteenth century. The densities are not strictly comparable; but the heavier pattern to the west of the boundary gives the correct impression. To the east, two concentrations are noticeable, between Rajajoki (the boundary river) and Laikkala gulf (on the isthmus) and around the Sortavala bight. The strategical alertness of this period was summed up in Olaus Magnus's celebrated *Carta Marina* (1539) and in his related 'History of the Goths, Visigoths and other northern peoples.'[2] His map of Finland was alive to the eastern frontier of conflict. By those who viewed it from the standpoint of emerging nationality, this period of partition (1323–1617) was regarded as among the more lamentable in Finnish history. The view was repeated by Zachris Topelius in his inaugural lecture "On Finland's geographical position," of 1 May 1854, when he was elected to a special Chair of History in Helsinki University.[3]

With the Peace of Stolbova (27 February 1617) Sweden removed a political boundary from the midst of Karelia, but exposed a religious frontier.[4] Orthodox centres had to be abandoned, Konevitz being left in 1610 and Valamo finally destroyed in 1611. Yet the religious allegiance of Sweden's newly acquired territories remained with Novgorod and when, in 1642, Käkisalmi province was brought within the bishopric of Viipuri (now Lutheran), migration followed. First, there was direct movement into Russia; in the 1650's alone, 4000 families are estimated to have migrated from the isthmus and, in the fifty years following 1640, church historians declare that Ingermanland lost more than half of its Orthodox population. There was also a retreat to the backwoods of Ladogan Karelia. This emigration of Orthodox Karelians was counterbalanced by an immigration of Lutheran colonists from Savo. Lutheran church parishes in Isthmian and Ladogan Karelia multiplied correspondingly, while baronies and counties were established to buttress the newly acquired frontier territories of Ladogan and

[1] *Historiallinen arkisto*, vol. 20 (Helsinki, 1906–08).

[2] An English translation of 1658; *vide* "Finland in the sixteenth century," *Geogr. Rev.*, 30 (1940) 400–411.

[3] Topelius is a much neglected name in Finnish geography. He was a political geographer before the days of political geography, a field worker before the days of field work and an authority on many sources which have since led the way to academic eminence. The manuscripts of his geographical lectures during the sessions 1854–57 are in the University Library at Helsinki and are remarkable documents in the history of Finnish geography.

[4] The ensuing period is described in detail by Arvi Korhonen, 'Suomen itärajan syntyhistoriaa,' Porvoo, 1938.

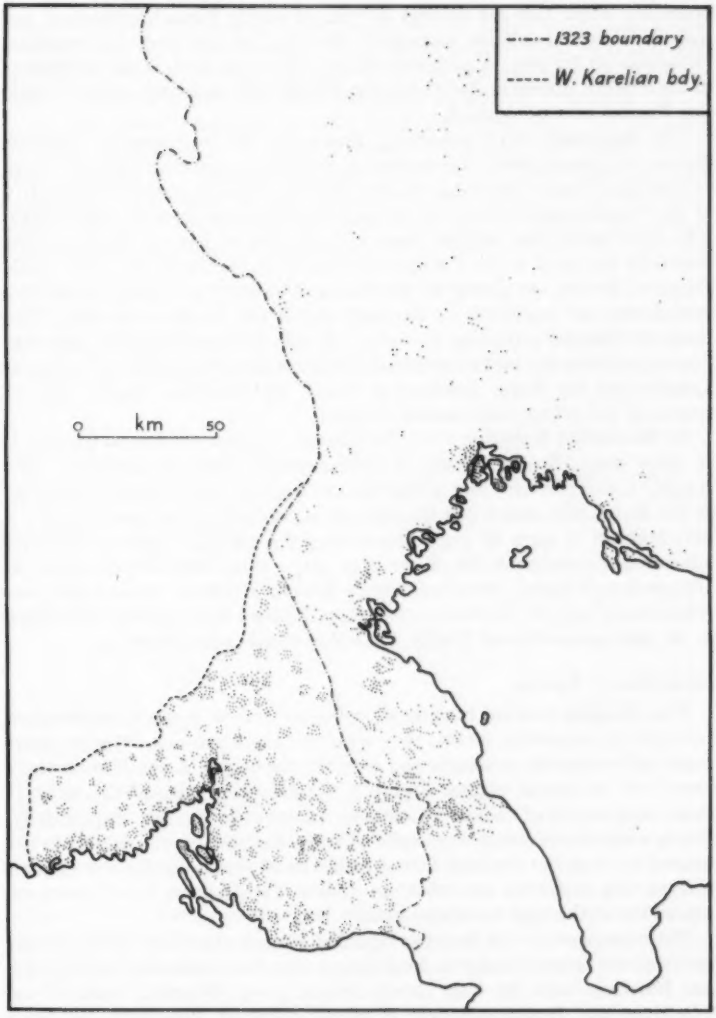


Fig. 3. Karelian settlement in the early sixteenth century

Border Karelia.[1] The Treaty of Stolbova anticipated the familiar 1811 outline of Finland. In north Karelia this had the positive result of removing a

[1] Symbolical of the complex ethnography of the area, as well as of national policy, was the publication in 1644 in Stockholm (by the Dutch printer Peter van Selow) of the Lutheran catechism in the Finnish language, employing Church Slavic script, for the "improvement" of the Orthodox Karelians.

boundary which had cut through an area of purely Finnish settlement and had made the inhabitants *ruotsalaiset* (Swedes) on the west and *venäläiset* (Russians) on the east. A probable relic of this in east Savo is the persistence of the Finnish surnames *Ruotsalainen* and *Venäläinen* although neither Swede nor Russian ever occupied it.

The important 1617 boundary, drawn by the cartographer Andreas Bureus, was inaccurately transmitted to west European map makers. Thus, in 1666, the French *Géographe du Roy*, Nicholas Sanson, traced the boundary of the Swedish realm eastwards through Karelia to the shore of Lake Onega. The error crept into English maps such as that of Richard Bloome (who dedicated his work to the Company of Eastland Merchants in 1669), while Emanuel Bowen, on a map of Sweden and Norway (*c.* 1750), traced two boundaries and engraved on the easternmost the laconic statement, "the limits of Finland according to some." It may be noted that his map was "corrected from the best observations communicated to the Royal Society at London and the Royal Academy at Paris." By this time Sweden was, of course, in full retreat from eastern Finland.

In the century following 1711, the Russian boundary advanced westwards in three steps. By the Treaty of Uusikaupunki (1721) it assumed a line roughly coincident with that of September 1944; in 1743 it shifted to the line of the Kymi river and ceded Karelia became in Swedish parlance *Gamla* (or old) *Finland*. A spate of maps documented the advance [1] and ecclesiastical adjustments accompanied it. After 1743 only a small Orthodox minority, in Ilomantsi and Liperi, remained outside Russian territory; monasteries were rehabilitated and, by December 1809 when Finland in its entirety took shape as an autonomous Grand Duchy, Orthodox parishes numbered 21.

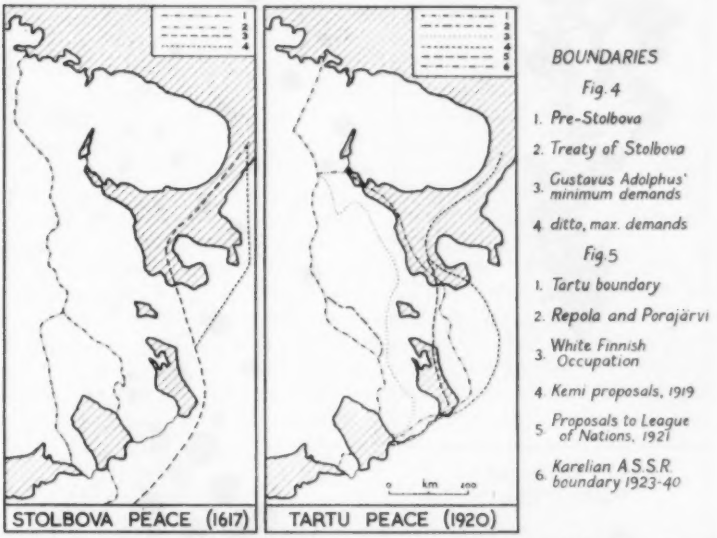
Aspirations in Karelia

The changing political boundaries in Figure 2 show stages of equilibrium between the contesting forces; they represent a compromise between maximum and minimum demands, and between the stages of equilibrium there have been revisionist claims. Figure 4, for example, balances the achievements and territorial claims of Gustavus Adolphus in Karelia. Superficially, Russia's maximum claims were satisfied when Finland became subject to her control in 1809; but Finland, united within itself, represented a new element with its own maximum and minimum claims. Pan-Finnism was the extreme expression of the urge to independence.

The exponents of this doctrine regarded Finnish stock beyond the boundaries of the Grand Duchy as inhabiting a vast *terra irredenta*, in which the east Karelians were the most clearly defined group. Vepsians, south of the Svir river, and Ingermanlanders in whose midst St. Petersburg had been planted, were more peripheral. Mordvicians, Cheremissians, Syrjenians and other autochthonous groups formed archipelagos of Finnish settlement in the broad Slavic sea beyond (*vide* 'Atlas of Finland,' Map 1). Philologists awakened Finnish interest in these related people and geography was called

[1] For example, the *Atlas russicus*, St. Petersbourg, 1745. Perhaps the finest atlas of Gamla Finland was Атласъ Выборгской Губерніи—a bound series of maps from the 1790's (*Valtion arkisto*, Helsinki).

in to substantiate their claims. Topelius, at the first lecture in his geographical course during the autumn term of 1855, philosophized upon geography and politics in a manner resembling that of the keenest determinists. He contrasted Peninsular Finland (*Suomenniemi*), unnaturally bounded by an eastern land border, with the Island of Finland (*Suomensaari*), "the great and complete Finland, with water on all sides." "It is this great concept which links us with our Karelian brothers whom peace settlements and state boundaries have separated from their stem for centuries." Physical geography, flora and fauna united the area in one natural region, and political geography should respond accordingly. August Ahlquist's plea was for



Figs 4 and 5. The boundary claims of Gustavus Adolphus and the plans for an independant Karelian Republic (after T. G. Aminoff)

dominion from Onega to the Gulf of Bothnia, from the Aura river to the Viena river on the White Sea shore.[1] In 1909, geographers, ethnographers and artists published jointly the 'Karjalan Kirja,' which treated Finnish and Russian Karelia as a unity.

It was natural that Imperial Russia should voice counter claims. N. N. Kovero, in "A lecture read before the United Nobility of the Russian Empire at St. Petersburg in March, 1910," propounded the following resolutions: "(a) the province of Viborg if left in its present condition, with a frontier not more than twenty miles distant from the capital and not subjected to the suspension of the Russian authorities, is a menace to the political and strategic

[1] Illuminating details are given in T. G. Aminoff, 'Mellan svärdet och kroksabeln; 700 års kamp om Karelarnas land,' Helsingfors, 1943.

interests of the Empire; (b) that the long-continued opposition to Russian imperial measures . . . centres precisely in Viborg; (c) the State can no longer tolerate at the gates of the capital an independently governed territory."

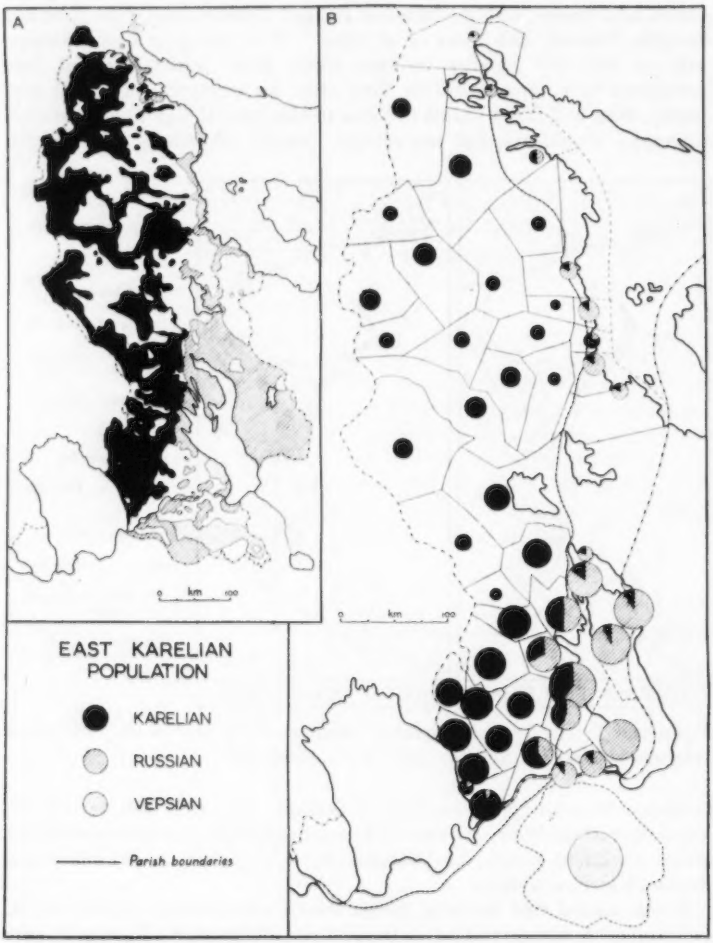


Fig. 6. The distribution of Finnish-speaking peoples in eastern Karelia according to M. V. Keynäs and (inset) according to the 'Karjalan Kirja'

The independent republic of Finland, born in 1917 as Peninsular Finland, never became the Island of Finland and revolutionary Russia relinquished the strategic claims of the United Nobility. Simultaneously, an autonomous

east Karelia had been proposed, with boundaries on the Svir river, lakes Onega and Viku, the river Viku and the White Sea. Union with Finland was considered as an alternative and the boundaries under discussion are shown in Figure 5. The Versailles Conference paid no heed to Karelian overtures and the autonomous Karelian Soviet Republic resulted. Two further appeals came from Finland, the second of interest because it was accompanied by an ethnographic map (Fig. 6, right).[1] Edited by W. V. Keynäs and drawn on a commune basis, it purported to show the distribution of Finnish-speaking peoples in east Karelia. Circles were drawn proportionally to show the distribution of approximately 130,000 Finnish-speaking Karelians on the Russian side of the boundary; Russian predominance in the more urbanized Onega area and along the line of the Murmansk railway (completed 1916) was evident. An uncertainly defined territory was ascribed to the Vepsians in the south. The map was based for the most part upon the Russian census for 1897 with modifications down to 1910; but the east Karelian ethnographic map of D. A. Zolotarev (Fig. 6, left) was probably more accurate, although it showed areal distribution without density.[2]

It is not inconceivable that the Finnish Academic Karelian Society, which intermittently stirred revisionist claims in the 1930's, resulted from the unsatisfactory boundary negotiations at Tartu in October 1920.[3] Restoration of Alexander I's boundaries meant for Finnish Karelia the relinquishment of the extensive parishes of Repola and Porajärvi and the Ingrian parish of Kirjasalo. The Tartu settlement was an uneasy compromise. Already in 1937 the U.S.S.R. was proposing boundary revisions which were given expression in the invasion of 1939 when the Terijoki government declared, "The time has come to make a reality of the Finnish people's century-old dream of the reunion of the Karelian people with those of the rest of the Finns that they might be united in one nation." [4] The consequences are embodied in the Karelian dispersion.

The Karelian dispersion

In March 1940 a new boundary line was drawn through Finnish Karelia—territorially approximating to that of 1721. As can be seen from the thirteen maps covering the frontier zone (*Suomen topografinen kartta*, 1 : 100,000, published Helsinki, 1946),[5] it was a purely arbitrary line which ignored physical features and economic considerations. The division of Karelia was reaffirmed in September 1944, for the ceded territories were re-occupied during the second Finnish War (1941–44). The ethnographic consequences

[1] 'Un appel de la Carélie Orientale au Peuple Danois,' Helsinki, 1921, and 'Le droit de la Carélie,' Helsinki, 1922.

[2] Redrawn for 'Karjalan Kirja' (1933) by V. Kalima and I. Härkönen from 'Karely S.S.R.', Leningrad, 1930. A similar distribution appears on the Russian map, *Carte ethnographique de la Sibérie dressée d'âprès les données du récensement de* 1897 *et des récensements locaux postérieurs*, 1 : 4,200,000 (1927).

[3] The text of the settlement is translated in L. Shapiro, *Soviet Treaty Series*, Vol. I, 1917–28 (Washington, 1950).

[4] The issue is dealt with authoritatively by J. Wuorinen, 'Finland and World War II, New York, 1948.

[5] There is a set in the R.G.S. Map Room.

of this territorial division were quite different from those of any earlier division. First, there was a migration from the area of almost the entire population (at least 400,000), which meant the injection of nearly a tenth of the population of Finland into the remaining nine-tenths of the country.[1] The displaced peoples not only lost their land but also their community structure. It is true that the so-called principle of "block transference" was put into effect, and that communities were moved *en masse* to reception areas; but the reception areas were invariably several times more extensive than the evacuation areas. Migration meant also the depopulation of the ceded territories—or at least the elimination from them of the Karelian people. In turn, this implied a break in the continuity of Karelian settlement across the political boundary.

The dispersal of the Karelians, principally to rural areas, has automatically thrown into relief the differences between them and other Finns.[2] In so far as national feeling is strongest on the borders of a country, the immigrant is more than a Finn: in coming from a country with mixed ethnography, he is less. One observer, intimate with French *pays*, describes the Karelian as the Gascon of Finland. Again, in the process of rehabilitation, it is natural that his home land should be romanticized. At home, fish were twice as long, fruit was twice as big, more birds sang, summer frosts were rarer. To one who would study the Finnish Karelians in dispersal the words of the Finnish Metternich, Gustav Mauritz Armfelt, may be commended. On despatching an investigator to reunited Karelia in 1811, he said, "Hear all, remember most, but give yourself time to weigh critically all that is told to you."

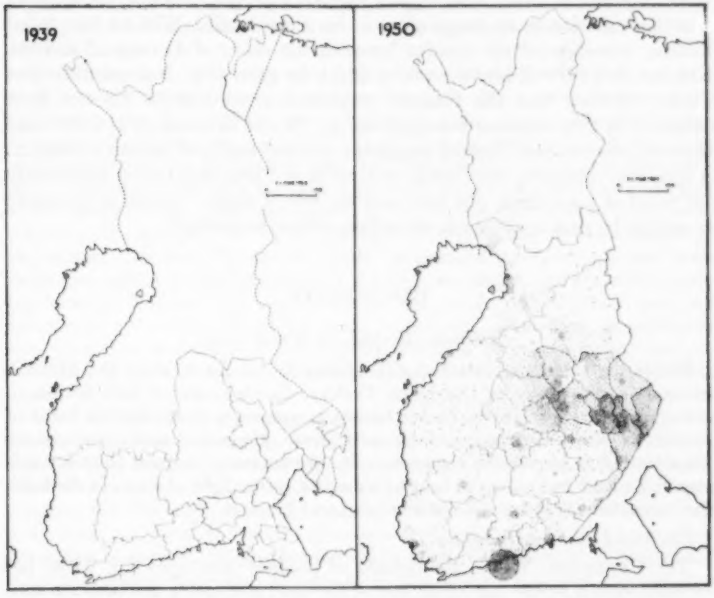
The consequences of redistribution, in the ethnographic field, may be illustrated by a map of Greek Orthodox Karelians in dispersal. The Orthodox church of Finland became autonomous in 1918 and centred in the bishoprics of Viipuri and Sortavala; most of its 70,000 adherents lived in Karelia and its parish structure is shown in Figure 7. With dispersal, the sees shifted to Helsinki and Kuopio, while the Settlement Law of 1949 called for a new framework of parishes based on geography and transport facilities. The resulting pattern (Fig. 8) hints at an inaccessibility reminiscent of the dispersed Lutheran communities described by John Paterson in his lakeland travels through Finland 140 years ago. For today, in a parish of 1500 square kilometres, a priest estimates that he travels 500 kilometres weekly in summer by train, bus, cart, bicycle and boat; in winter by sleigh and ski. Travelling priests are one means of holding together these rural communities. Other ethnographic microcosms weakened by the evacuation are the Russian-speaking monasteries; nearly 100 Valamo monks now farm a 300-hectare estate in Heinävesi, while Konevitz monastery has found asylum on an estate in Keitele.

Figure 8, based on the returns for more than 400 parishes, also shows the distribution of Orthodox Karelians at midsummer 1950. The areas receiving the heaviest Orthodox immigration were North Karelia and the urban

[1] 'Suomen maantieteen käsikirja,' Helsinki, 1951. See also my paper, "The Finnish outlook east and west," *Geogr. J.* 113 (1949) 9–20.

[2] They were investigated in 1948–50 by *Yhteiskunnallinen korkeakoulu*, Helsinki; see H. Waris, *et al*, 'Suomen karjalaisen siirtoväen sosiaalinen sopeutuminen' (in press).

district of Helsinki (7000). Those receiving the heaviest immigration relative to pre-existing Orthodox settlement were Iisalmi, Kiuruvesi, Nurmes and Rautalampi. These lakeland communes, bearing a physical resemblance to certain of the New England colonies, have a kindred pietist outlook; and to this home of Lutheran pietism have come some of the most inveterate Orthodox adherents. The Orthodox dispersal represents the splintering of a specific group within the general group of displaced people, so that the



Figs. 7 and 8. Orthodox parishes and the distribution of Orthodox Karelians[1]

Orthodox Karelians have become a minority within a minority.[2] The ethnological map of a small corner of Europe has been fundamentally altered.

Conclusion

Finnish Karelia, this tenth of the country which is so much a part of Finland but which throughout history has been so much of Finland apart, is a human region lacking precise physical identity. Its five parts, developing differently as a reaction to outside forces, have also known artificial detachment from a White Sea flank settled by ethnographically similar peoples. Finnish Karelia has suffered a Balkan instability of boundaries, experiencing division under

[1] Figure 7 is derived from 'Kouluhallitus,' Helsinki. The sources for Figure 8 are *Aamun Koitto* (January 1950) and 'Grekalais-katollinen kirkkohallitus,' Kuopio. (Each dot represents 100 persons.)

[2] Aspects of this minority are dealt with in a classic study by M. Haavio, 'Viimeiset runonlaulajat' Porvo, 1948.

no less than nine peace settlements. Those of the twentieth century, which has repeated for Finland its eighteenth century "Age of Wrath," have produced an unparalleled population shift. That "essential mischief playing upon the vitals of the country," which the English traveller Joseph Marshall observed during his journey through interior Finland in 1768, has restored the phrase *Vanha Suomi* (Former Finland) to the geographical vocabulary of the country. The Finnish Karelians are a people without a land, their ceded home province is now a land largely without a people. In exile, the Finnish Karelian experiences an exaggeration of his individuality. Without him ceded Karelia, administratively divided between the *oblast* of Leningrad and the Karelian S.S.R., will lose the stamp which he gave to it. Natural historians would conclude that the Finnish emigration from Karelia has not been balanced by proportionate immigration, for the rise in numbers of wolves and bears entering eastern Finland suggests a reduced buffer of human resistance. A medieval chronicler once spoke of Karelia as a land of invasion recurrently "silenced of cock-crow, dog bark and the low of cattle." Invasion by nature as well as by man again spells the eclipse of this borderland.

DISCUSSION

Afternoon Meeting, 12 March 1951

Before the paper the CHAIRMAN (Professor W. G. EAST) said: Dr. Mead is lecturer in geography at University College, London, and is well known to many of you. He might be better known to you were it not for his habit of foreign travel to which he is so frequently prone. He goes abroad not to change his skies but to pursue his researches. He has recently returned from a year's stay in Finland and we are to hear him discuss, in the light of study in the field, the borderland between the Soviet Union and Finland.

Dr. Mead then read his paper

The CHAIRMAN: Within the context of political geography Dr. Mead has brought vividly before our minds one of the most interesting and hitherto contested borderlands of Europe, where different ethnic groups and states of culture adjoin. He has confined his attention to one side of the line and it might be argued that frontiers, like quarrels, are two-sided; no doubt, Dr. Mead has good reasons for so confining himself to the Finnish aspect, and he certainly had plenty to show us even by confining his attention to the one side only. Though a somewhat unfair and academic question, I would like to ask him whether his study of the history of the political geography of this borderland has suggested to him what should be the precise line to draw, were it an ideal world and he called upon to give his counsel in that regard. As it is, there is now a boundary which is to the advantage of the greater neighbour. But I would make one point—to glance for a moment at that side and recall what Dr. Mead told us that Peter the Great himself had said about Viipuri and the Isthmus—that the boundary which did exist in the inter-war period was a very bad one, looked at from the Soviet angle, because their great city, Leningrad, seemed to them highly vulnerable were any attack launched from Finland; looking at the boundary adjustment after the Second World War, there would seem to be something to be said for it, in particular from the Soviet point of view.

We have with us this evening one or two guests who have in various ways

interests in Finland, and I ask Miss Hicks of the Royal Institute of International Affairs to address us.

Miss A. H. HICKS: I listened with great interest to Dr. Mead's lecture In particular also to his admirable summing up of the effects which the loss of Karelia had on Finnish economy. The practical manner in which the Finnish government handled the resettlement of the evacuated population of those regions very much impressed me at the time and I would like to give a few facts concerning this resettlement which may be of general interest; I feel that the Finns have set an example of how to deal with displaced persons which may well be studied by those whose task it is to deal with these unfortunates in other parts of Europe.

In Finland about 428,000 people had to be resettled; of whom 78 per cent. were peasants, 27,000 industrial workers and more than 90,000 town-dwellers. Agriculture was obviously the only industry which allowed the necessary expansion, but any attempt to maintain the 1938 living standard required about one million hectares of new farming land and was therefore not a practical possibility. It was consequently decided to create 30,000 new farms of an average of 15 hectares with some forest land adjoining, the necessary ground to be obtained by voluntary expropriation. A bill was passed empowering the government to requisition such land. In certain cases, for instance where estates had been neglected, partial or total confiscation was even envisaged, but generally speaking large landowners were voluntarily to cede 10 per cent. of their land and industrial enterprises up to 50 per cent. In practice, landowners were allowed to acquire the land to be transferred by purchase elsewhere rather than by detaching it from their own property, and many availed themselves of this permission.

A further law fixed a premium for the clearing of fresh ground ready for farming and thus encouraged settlers to advance into the north where unattached and uncultivated land was still plentiful. Many controversial issues arose of course, but it is impossible to enter into these here. I might however mention that the expropriation as a whole affected Swedish-speaking Finns more than the Finnish-speaking population, which could hardly be avoided since most of the great landowners were in fact Swedish-speaking. The financial resources necessary to carry out the resettlement were acquired by increased taxation, by loans and by capital levies.

Other schemes for helping the Karelians included the building of new factories in the north, with its enormous resources of untouched water-power, while employment was also provided through the renovation of residential and factory buildings in Finland proper.

However, these plans did not mature quite as quickly as had been anticipated so that by the time the second Russo-Finnish war broke out, which automatically put an end to the whole scheme, resettlement was by no means complete. A great deal of preparatory work had nevertheless been done, enormous sums of money had been spent and experience gained which proved useful when Finland had for a second time to deal with the same problem.

When the Finnish army re-occupied Karelia, in September 1941, nearly the whole evacuated population applied for readmission to their old homes and it must now be regarded as fortunate that local conditions did not allow of their immediate return. Agricultural and forest districts in Karelia had suffered about 20 per cent. damage, while the damage in towns (to houses and mobile property) was assessed at from 60 per cent. to 100 per cent. The position was further aggravated by shortage of food for man and beast. The Finnish govern-

ment decreed therefore that workers only should be allowed to return while their families should stay behind. This resulted in great financial stringency among the Karelians but turned into a blessing when, in due course, they had to leave their homeland for the second time.

When this second evacuation had to be faced there could no longer be any doubt that the loss of Karelia was final. The Finns are realists. They are a hard-headed, hard-working race who have always been at their best when facing great odds. They tackled the fearful task before them with undiminished vigour. The same policy was adopted as before but with the difference that the ceding of land was made compulsory. About 450,000 hectares of tilled arable land and approximately 500,000 of forest land were needed. Apart from the ground obtained under the Land Procuration Act, the clearing of new fields by mechanical means was taken in hand on a large scale by a company specially formed for this purpose; and the productivity of the land was also improved by various means.

The resettlement of her Karelian population was only one of the enormous tasks which faced Finland after the end of the war and it was not the only one in which she has set an example of high courage when facing nearly superhuman difficulties. In the Year Book it is stated that "The Finnish people regard a faithful and scrupulous fulfilment of the obligations laid down under the Peace Treaty as a guarantee for their country's future existence and security." To this end they have striven and are striving still. The time is drawing near when the arduous reparations etc. which were imposed upon them by the Soviet Union will be completed. Let us hope that no new complications will then arise, for surely no people have more truly earned their freedom and independence than this gallant small nation in the far North.

Mrs. J. A. STEERS: I should like first to say how great has been the interest of Dr. Mead's paper, both for the historical and political geographer in general and for those interested particularly in this region. He has raised various points about which I should be very glad to have his further comments.

First, how far does Dr. Mead think that the continued sub-division of land in Finland is going to make for prosperity in forestry? Finland is a country in which it is admittedly hard to draw the distinction between forestry and farming: it is too, a high latitude country in which the family farm is important for the employment of land which might otherwise become waste. But I should be interested to know how far the parcelling out of valuable forest land among refugees is likely to hamper the major economy of the country.

Secondly, I should like to know how far the new south-eastern frontier of Finland coincides with the great morainic ridges which curve in such remarkable symmetry across the south-east and east of Finland. Does the new line in any way suggest a natural frontier? Thirdly, how far was the Finnish population, leaving Viipuri on account of the change in frontiers, compelled also to a change of occupation. Was it a matter also of adjusting people with a manufacturing and trading background to a new way of life in farming and forestry?

Lastly, I should like to hear Dr. Mead's views on Mr. Shearman's recent work on the history of Finland. How far does he think that the Finnish national movement of the nineteenth century was the pre-occupation largely of the Swedish minority in Finland and of a small middle-class. Was the Finnish peasant less interested in the national movement on account of his great poverty, and more in his own resentment of living on the margin of existence?

Dr. W. R. MEAD: Mr. Chairman, there is a Karelian proverb which runs "Don't open your mouth too widely, you may cause a draught." It is usually

employed in a domestic rather than a diplomatic context; but I would use it as an excuse not to propose an ideal boundary. The comments of Miss Hicks prompt two remarks. First, there is as yet no adequate description of the Finnish exodus—surely one of the more remarkable sagas of recent history. Equally remarkable is the fact that resettlement has been completed. In August 1950, only three hundred farmers were still without holdings. Rural resettlement leads me to Mrs. Steers' first question. The creation of many new woodland farms means that timber stands are likely to suffer, both directly from their clearance for new farm land and indirectly from the reduction of economies when holdings are fragmented. However, under the direction of *Tapio* (the foresters' association) a woodland *légende* is being fostered to parallel that already existing in agriculture. In practice it means woodland improvement through scientific cutting, drainage, the elimination of grazing etc. Some thousands of displaced farmers elected to forego their right to new holdings and may be presumed to have been absorbed into lesser industrial settlements like the satellite towns of Tampere or the factory towns of the Kymi valley. The greatest urban movement was to Helsinki from Viipuri. Two questions in political geography raised by Mrs. Steers remain, and the first is answered more easily. The morainic ridges which extend from southern into south-eastern Finland may suggest a natural frontier zone on a small-scale map; but the detail of the new political boundary appears to have been decided without regard to physical facts of strategic consequence. The issue arising from Mr. Shearman's book is less easy to discuss; it is true that the spur to independence derived less from the backward, famine-afflicted interior of the country than from the progressive coastal areas; but on the other hand, rural dissatisfaction was associated less with the interior than with the coastal areas of Finland. These coastal areas of the south, including parts of Karelia, were the background to the historical estates and baronies which were largely broken up after Finland gained her independence. In the matter of land reform, Karelian reactions were not distinct from the rest of Finland but were similarly divided according to foreland and back-country.

SOME RECOVERED RELICS OF DAVID LIVINGSTONE

J. I. MACNAIR

THAT THE GENERAL attitude towards Livingstone in the Victorian age was something much deeper than the homage due to a great hero is shown by the way in which an extraordinary number of personal relics—letters, curios, sections of the tree beneath which his heart was buried in Ilala, and much else—have been reverently preserved in homes all over the country. When it became widely known in about 1928 that the house where Livingstone was born, at Blantyre in Lanarkshire, had been converted into a place of pilgrimage, a steady stream of these household treasures began and the collection now on exhibition there is unsurpassed in the world. Though many of these relics, especially the manuscripts, have a considerable market value (a good Livingstone letter fetches at least £50), payment has very rarely been suggested and almost everything has been freely given.

A collection of papers and maps recently and unexpectedly handed into the charge of the Blantyre Memorial Trust is, with the exception of that in the archives of the London Missionary Society, the most valuable known to exist. It includes five autograph field-maps of Livingstone's Central African explorations and one of his Trans-African journey (1866–73). The manuscripts include note-books, log books and a great amount of miscellaneous matter. A minor portion concerns the Zambezi expedition (1858–63) and the rest contains all that is known of the final seven-year journey among the Central African river basins (1866–73). It is on these last that Livingstone's third book 'The last journals' was based. The authenticity of this great mass of material was immediately apparent; it is all, or nearly all, in the explorer's characteristic handwriting. He used three distinct types of penmanship. The most common is that of a very rapid writer, letters imperfectly formed but in general easily legible; the second, which he uses in his diaries, is the same script but smaller and penned with the neatness almost of copper-plate. In the inscriptions of his maps on the other hand, he uses a type of lettering that has little in common with his usual style.

Apart from the maps the chief interest of this collection lies in the large number of pocket note-books ($5\frac{1}{2} \times 3\frac{1}{2}$ inches) that contain the day by day records of the last journey. These make clear the Doctor's methods of recording and explain the accuracy and completeness of his observations. It was his invariable custom to carry in his pocket one of these small books and to jot down on the spot, or soon after, everything that caught his eye and interest. These notes are in pencil, blue or black, and to one or two of these books pencils are still attached. The notes are in general rough, not usually more than jottings, with little care shown as to language, but have all the vividness of first impressions. The books abound in thumb-nail sketches and small-scale maps. The Missionary was no artist, any more than he was a musician, and the pictures are crude, but they serve excellently the purpose for which they were intended. They illustrate tribal marks, the shapes of trees and plants and occasionally the outline of mountains. Faded leaves and flowers are found pressed here and there.

The pocket books represent the first stage of his record making. The next

was, as leisure permitted, to enter these jottings into strongly bound and, for some strange reason, locked books about the size of the old-fashioned family bible. In spite of all his transport difficulties, he carried one of these with him always, from the Kolobeng days on. Three at least have been preserved. 'The last journals' reproduces practically verbatim the diary that went with the last expedition; and a comparison of the final text with note-books is interesting. While naturally the substance is the same the minor differences are endless, changes in matter and sometimes in dates, many omissions and frequent additions, and a marked tidying up of the style. It may be concluded that these changes were made with a view to publication in due course.

But the content of these booklets is not confined to the narrative, which is all that Waller, the editor, used. At the back of each note-book and beginning from the last page, Livingstone has entered a great variety of matter not strictly connected with the travel-story, geographical and other scientific detail and records of rainfall, altitude and so on. If he had lived to write and publish his last records himself he would doubtless, as he did in his other books, have incorporated much of this material. It may well be that these disconnected jottings contain matters of value. As far as is known, they have not yet been systematically examined by a competent geographer, though there is a prospect that this may be done before long. All the odd corners are filled with notes on the languages of the tribes through which he passed. Language was always with Livingstone a major interest.

In the beginning of his expedition in 1864, Livingstone estimated that his search for the sources of the Nile would take him two years. The journey actually took seven, and in consequence he ran short of writing material about the end of his fifth year when in the Manjuema country and had to be content with any scraps of paper, even news-script, that he could get. We find him using for the continuance of his diary notes rough quarto-sized note-books, bought doubtless from Arab traders, and these carry on the narrative till the arrival of H. M. Stanley. The paper is of the poorest quality and this must have irked Livingstone who was fastidious in such matters.

Of the pocket books there remain four yet undescribed, and these are in a most important respect different from the others and of supreme value. The books themselves must be from the stock that the Traveller had asked Sir John Kirk to send him to Ujiji, and which he found waiting on his return from the Manjuema country.

His diary had been locked and sealed, as the story tells, with the most elaborate care and committed to Stanley to be delivered in London to the care of the Royal Geographical Society. There was therefore no large book into which notes might be posted. Thus these four booklets became themselves the diary and are written, as far especially as the style is concerned, with a care that would fit them for publication without alteration. These notes contain, with the exception of such stories as the African "boys" could tell, all that can be known of the epic struggle that ended in May 1873 in Chitambo's village.

This is a deeply pathetic record. It begins with confidence. The writing is firm and the ink black. It ends in the feeblest of jottings, made with the stump of a pencil that is still attached. In between there is all the evidence of a tremendous will to carry on in spite of daily increasing weakness and to the last his acuteness of observation is amazingly shown. All the time he was fighting the doubt that the river he was so laboriously tracing might turn out after all to be the Congo, and not the "Fountains of the Nile" of his mystic dreams.

Among the detached papers is one signed by Stanley. It is a list of the porters whom he had sent up from Zanzibar to enable Livingstone to complete

his journey. Among the names are three that used to be household words, Jacob and John Wainwright and Matthew Wellington.

The question naturally arises as to where the precious papers have been lying all these years. The story is simple. On Livingstone's death a very large quantity of personal relics was divided among his family, and this special collection went to his elder daughter Agnes (Mrs. Livingstone Bruce) the lady who had so large a share in the founding of the Royal Scottish Geographical Society. On her death they passed to her eldest son, and on his decease they were taken charge of by another member of the family in whose attic in Edinburgh they lay undisturbed for many years. Now they are on view in the Blantyre Memorial. The originals of the maps are not shown but may be seen on application to the Warden.

It needs in conclusion to be said that, apart from the possible exception already indicated, there is little that is new in these papers, little that has not already been published. Horace Waller was a most conscientious editor and except for a few small matters that he judged were at the moment inexpedient to print, he kept nothing back.

SOUNDINGS IN BALA LAKE

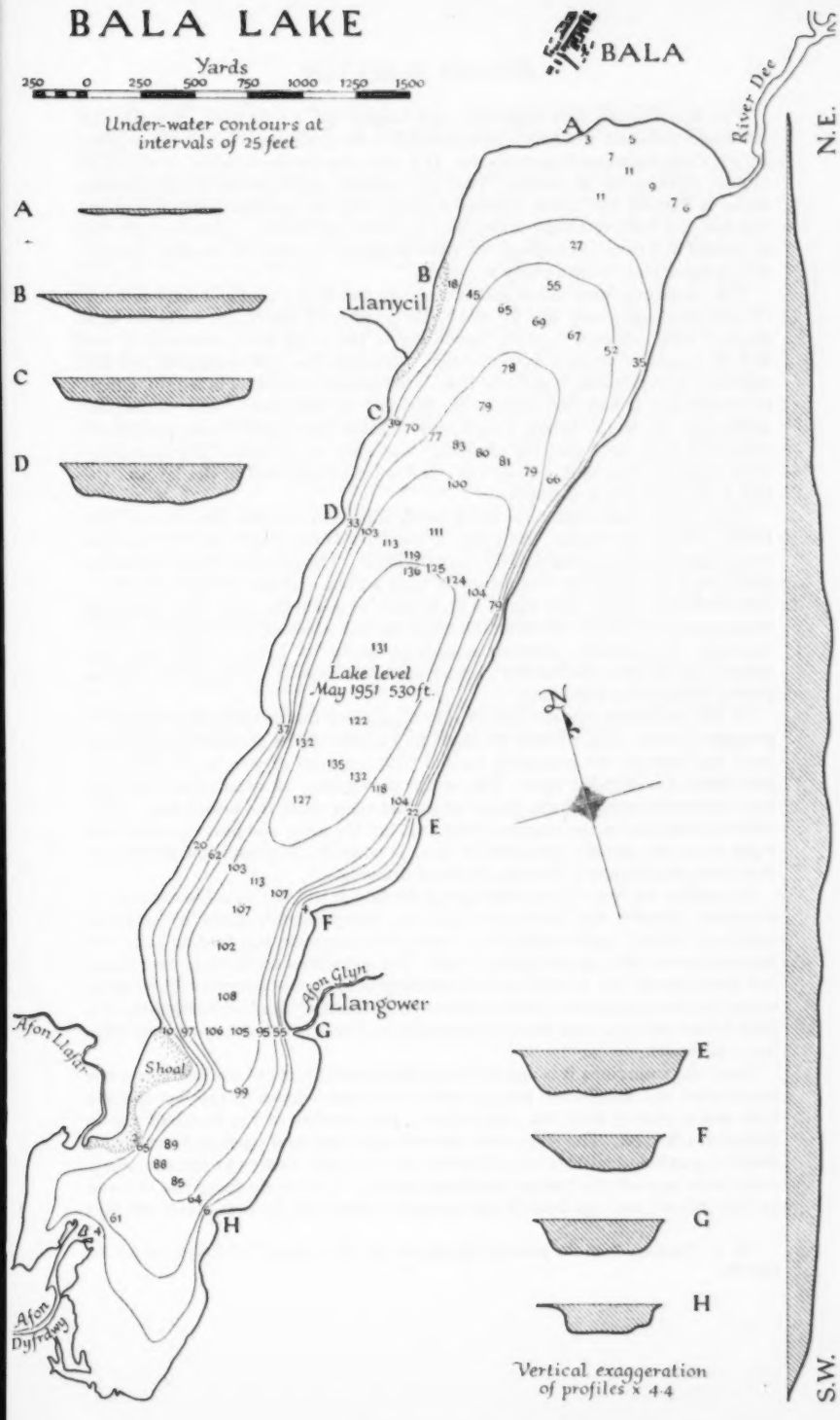
A. M. FERRAR

HEAWOOD AND MILL conducted bathymetrical surveys of the English Lakes in 1893 [1] and Murray and Pullar extended the work to the lochs of Scotland [2] but no surveys appear to have been made in Wales and, although the lakes of Wales are small and few, this leaves a gap in the hydrography of Great Britain. I determined to remedy the omission and, with the valuable assistance of my brother who has experience of small naval vessels, attention was first turned to Bala Lake, the largest natural sheet of water in Wales. It is of special interest because of Philip Lake's view [3] that its basin originally formed part of the Afon Wnion, which flows in a south-westerly direction to enter Cardigan Bay and from which it is now separated only by a low watershed. The town of Bala stands at the lower end of the lake on an alluvial plain a little larger than that behind the delta at the upper end; the occurrence of alluvial plains at both ends of the lake certainly suggests that the drainage has been reversed.

[1] H. R. Mill, "A survey of the English lakes," *Geogr. J.* 4 (1894) 237–46; and "A bathymetrical survey of the English lakes," *Geogr. J.* 6 (1895) 46–73, 135–66.

[2] J. Murray and F. P. Pullar, "A bathymetrical survey of the freshwater lochs of Scotland," *Geogr. J.* 15 (1900) 309–52, 17 (1901) 372–95; J. Murray and L. Pullar, "Bathymetrical survey of the fresh-water lochs of Scotland," *Geogr. J.* 22 (1903) 237–69, 521–41; 23 (1904) 32–61, 444–73; 24 (1904) 65–79, 546–74; 25 (1905) 268–86; 26 (1905) 42–69, 519–34; 27 (1906) 144–65, 566–85; 28 (1906) 592–615; 30 (1907) 62–71, 398–419; 31 (1908) 42–57. See also J. Murray and L. Pullar, 'Bathymetrical survey of the fresh-water lochs of Scotland,' London, R.G.S., 1908, and 'Bathymetrical survey of the Scottish fresh-water lochs: report on scientific results,' Edinburgh, 1910.

[3] P. Lake, "Bala lake and the river system of north Wales," *Geol. Mag.* (1900) 204–15, 241–5.


BALA LAKE
Yards
250 0 250 500 750 1000 1250 1500
Under-water contours at intervals of 25 feet
BALA
River Dee
N.E.
S.W.
A
B
C
D
E
F
G
H
Llanycil
Llangower
Afon Glyn
Afon Llafar
Shoal
Afon Dyfrdwy
Lake level May 1951 530 ft.
Vertical exaggeration of profiles x 4·4

The lake is nearly four miles long and roughly half a mile wide, its major axis running north-east and south-west parallel to the grain imposed on the country by the Caledonian earth movements. If it were not for three deltas, it would be almost rectangular in outline. The only reliable estimates of its depth were those of Ramsey and Lake, Ramsay stating [1] that the maximum depth is about 130 feet and Lake recording a depth of 126 feet. As however a depth of 300 feet is quoted in a book on angling, we went prepared to measure depths considerably greater than those already recorded.

The soundings were taken with a seven-pound boat's lead and sixty fathoms of cod-line, generously lent by the Hydrographer of the Navy. Fathoms were marked with coloured bunting, according to the usual naval convention, and feet by pieces of knotted mackerel line. Although the light weight of cod-line rendered it so suitable, it suffered from considerable variations in length, chiefly by shrinkage; it had therefore to be checked several times and corrections applied to the work. When it had settled down fairly well it was completely remarked while still wet; the shrinkage was over 10 per cent. The soundings were taken in May and August 1951 and were all adjusted to the level of the lake at the first day's operations.

Most of the soundings were along straight lines across the lake, that is from north-west to south-east, the ends of the lines being points on the shore at which reasonably good landmarks were available. The distance of each sounding from one end of the line was measured with a three-quarter-mile length of fine line marked at every sixty yards with a piece of green bunting. Red markings were placed alternately between the green so that when rapid changes of depth occurred the distance between soundings could be halved. This line was allowed to run out over the stern under moderate tension and as each mark was passed a sounding was taken.

At the beginning of each line of soundings, two marks were aligned on the proposed course and, without so much as a glance at the other shore after the work had started, we invariably landed within a yard or two of the point we had previously decided upon. The width of the lake, as determined with the line, was consistently a little greater than that taken from the 6-inch map. This was no doubt due to the sagging of the line, but the error was never greater than 6 per cent. and usually considerably less. It could be assumed that the soundings were equidistant within the limits of drawing.

In making the line of soundings along the lake it was not possible to measure distances directly, and each sounding was independently fixed by compass bearings; sextant angles might have been more accurate, but finding sufficient landmarks was difficult enough as it was. The soundings on this line were about 200 yards apart, but several at the beginning (the north-eastern end) departed somewhat from their intended positions on account of the bad navigation of a land-lubber and one near the south-western end because of an error in identifying a landmark.

From the soundings it is apparent that the general form of the lake basin is a steep-sided and flat-floored trough, with a maximum depth of 136 feet about a mile and a quarter from the northern end and another of 135 feet half a mile farther south-west. The slope from the northern end to the point of maximum depth is gentle and fairly steady. Then for the half-mile to the 135 feet sounding, and a little beyond, the bottom undulates gently. A relatively sharp rise of some 30 feet follows, and the bottom then remains practically level at about 100 feet

[1] A. C. Ramsay, "On the physical history of the Dee, Wales," *Q.J.G.S.* 32 (1876) 219–29.

to within half a mile of the southern end. The rise from this point is at first gradual, but steepens upwards to the end of the delta of the upper Dee (Afon Dyfrdwy).

Of the transverse sections, B, C and D best show the form of the main trough. The north-western end of section E is steepened by what appears to be the delta of a very small stream, F and G are modified by the Llangower delta, G and H by the Llafar delta, and the south-eastern end of H by another small delta. It will be noticed that the presence of a delta is marked by an off-shore shoal of varying width, followed by a very steep slope which is probably determined by the angle of rest of the material. The term "shoal" is here used to indicate an area of shallow water bounded, except on its landward side, by a sharp increase in depth. The shallow water at the north-eastern end of the lake is not a shoal in this sense as it forms part of the steady slope already mentioned.

It was not possible to obtain bottom samples but, except at the southern end, the shore is composed of sub-angular fragments of hard, grey mudstone, 3 to 5 inches in diameter. This continues down to a depth of about two fathoms, beyond which the water was too opaque for visual observation. In the Llangower and Llafar deltas the mudstone fragments are mixed with pebbles of other materials brought down by the streams; only at the southern end around the Upper Dee delta was any fine-grained material found. Here it consists of mud of various shades of brown and yellow and is plentifully clothed with weed.

The lake occurs entirely within the outcrop of the hard Ordovian mudstones and is considered by Lake to be mainly due to faulting. Undoubtedly the south-eastern shore shows the effect of the major Bala fault very clearly.

While this paper was in the press we heard from Professor R. J. Pumphrey, F.R.S., of the Department of Zoology, Liverpool University, of a more detailed survey of Bala Lake which has been carried out by members of that department in 1951, using an echo sounding machine.—Ed. *G. J.*

ENGLISH CONURBATIONS IN THE 1951 CENSUS

E. W. GILBERT

CENSUS FIGURES are usually limited to areas defined by local government boundaries. Professor C. B. Fawcett made two attempts to improve on these figures by adding together the populations of groups of British towns which, in his opinion, formed one urban region. His first paper on this subject, "British conurbations in 1921," [1] was based on the census of 1921; the second, "Distribution of the urban population in Great Britain, 1931," [2] was the result of his analysis of the census of 1931. The word "conurbation" was probably invented by Sir Patrick Geddes in his 'Cities in evolution' (1915); it has been much criticized but no other single word has been brought forward to convey adequately the meaning of "a continuously urban area." The term "major aggregation of population" is far too clumsy.[3]

Previous censuses have given the population of Greater London, an area that is somewhat smaller than that of the real conurbation. The census of 1951 is notable because it is the first to record the populations of the five great provincial conurbations, namely South-east Lancashire, West Midlands, West Yorkshire, Merseyside and Tyneside, as well as that of Greater London. The *Preliminary Report* of the 1951 census for England and Wales speaks of the long-felt need for statistics of the provincial conurbations, but says that it was difficult not only to decide how many of these concentrations of population should be chosen but also how they should be defined. It explains (p. xxii) that in 1950 "the Interdepartmental Committee on Social and Economic Research (which includes academic as well as Departmental members and is serviced by the General Register Office) took the matter into consideration and prepared provisional suggestions for the six major groupings in Great Britain outside London.[4] In the result agreement was reached, under the aegis of the Committee and the Central Statistical Office, on the conurbations to be used for the presentation of official statistics generally."

Each conurbation has been defined in terms of complete local government areas. For instance Greater London consists of the City and the 28 metropolitan boroughs of the County of London; and of 66 county boroughs and county districts in Surrey, Kent, Middlesex, Hertfordshire and Essex. The list at the end of this paper shows how each conurbation is composed in terms of local government areas. The conurbations have not been defined with exactly the same boundaries as those selected by Professor Fawcett in 1931; it would be easy to argue the merits and shortcomings of the two schemes. Fawcett's

[1] *Sociological Review*, April 1922.

[2] *Geogr. J.* 79 (1932) 100–16.

[3] The word "conurbation" was defined by the Central Statistical Office in August 1951 as an area "of urban development where a number of separate towns have grown into each other and become linked by such factors as common industrial or business interest, or a common centre of shopping or education.

[4] Central Clydeside is the other British conurbation whose boundaries were defined by the Central Statistical Office. But the *Preliminary Report* on the 1951 census of Scotland neither lists the local government areas of which Central Clydeside is composed nor records its total population.

Area 148 sq. miles
Population 1,382,244

Area 90 sq. miles
Population 835,332

Area 379 sq. miles
Population 2,421,011

Area
480 sq. miles
Population
1,692,190

Area 268 sq. miles
Population 2,236,723

Area 721 sq. miles
Population 8,346,137

— Administrative County of London

Miles
5 0 5 10

The six conurbations as defined in the census of 1951

Tyneside is considerably larger than the corresponding area as defined by the Committee; and it seems that the Committee would have produced a more realistic picture of the present extent of the conurbations if they had drawn some of their boundaries more generously.

The *Preliminary Report* does not include a map of the conurbations as now defined for official statistics, but the maps accompanying this paper show which areas have been chosen. Their areas and populations are set out in the following table.

Conurbation	*Area in square miles*	*Population 1951*	*Increase or decrease per cent. 1931–51*
Greater London	721	8,346,137	+ 1·6
South-east Lancashire ..	379	2,421,011	− 0·2
West Midlands	268	2,236,723	+15·7
West Yorkshire	480	1,692,190	+ 2·2
Merseyside	148	1,382,244	+ 2·6
Tyneside	90	835,332	+ 1·0
Total	2086	16,913,637	+ 3·1

This table brings out the startling fact that nearly 17 million people of the 41·1 million in England now live in six great conurbations, whose total area is only about 2100 square miles (roughly the size of the county of Norfolk). The *Preliminary Report* (p. xxii) calls attention to the fact that "in three of the conurbations, S.E. Lancashire, W. Yorkshire and Tyneside, the population has been virtually stationary for the past 30 years and that in Merseyside a like condition applies in respect of the past 20 years," and also points out that the West Midlands conurbation "stands apart in recording substantial and continuous growth" since 1921.

The composition of the conurbations

In the following lists the first 29 areas of Greater London consist of the City of London and the 28 Metropolitan Boroughs, which together make up the Administrative County of London. C.B. denotes a County Borough, M.B. a Municipal Borough and R.D. a Rural District; the others are Urban Districts. In each conurbation a number is given to every local government area and these numbers are marked on the map. The figures following each name in brackets are the 1951 populations in thousands.

1. GREATER LONDON

(*a*) *Administrative County of London* (3348)—1. Battersea (117); 2. Bermondsey (60); 3. Bethnal Green (58) 4. Camberwell (179); 5. Chelsea (50); 6. Deptford (75); 7. Finsbury (35); 8. Fulham (122); 9. Greenwich (91); 10. Hackney (171); 11. Hammersmith (119); 12. Hampstead (95); 13. Holborn (24); 14. Islington (235); 15. Kensington (168); 16. Lambeth (230); 17. Lewisham (227); 18. City of London (5); 19. Paddington (125); 20. Poplar (73); 21. St. Marylebone (75); 22. St. Pancras (138); 23. Shoreditch (44); 24. Southwark (97); 25. Stepney (98); 26. Stoke Newington (49); 27. Wandsworth (330); 28. Westminster (98); 29. Woolwich (147).

The Outer Ring (4997)

(*b*) *Surrey* (*Part of*) (1071)—30. Croydon C.B. (249); 31. Barnes M.B. (40); 32. Beddington and Wallington M.B. (32); 33. Epsom and Ewell M.B. (68); 34.

Kingston upon Thames M.B. (40); 35. Malden and Coombe M.B. (45); 36. Mitcham M.B. (67); 37. Richmond M.B. (41); 38. Surbiton M.B. (60); 39. Sutton and Cheam M.B. (80); 40. Wimbledon M.B. (58); 41. Banstead (33); 42. Carshalton (62); 43. Coulsdon and Purley (63); 44. Esher (51); 45. Merton and Morden (74).

(*c*) *Kent* (*Part of*) (474)—46. Beckenham M.B. (74); 47. Bexley M.B. (88); 48. Bromley M.B. (64); 49. Erith M.B. (46); 50. Chislehurst and Sidcup (83); 51. Crayford (27); 52. Orpington (63); 53. Penge (25).

(*d*) *Middlesex* (2268)—54. Acton M.B. (67); 55. Brentford and Chiswick M.B. (59); 56. Ealing M.B. (187); 57. Edmonton M.B. (104); 58. Finchley M.B. (69); 59. Hendon M.B. (155); 60. Heston and Isleworth M.B. (106); 61. Hornsey M.B. (98); 62. Southall M.B. (55); 63. Southgate M.B. (73); 64. Tottenham M.B. (126); 65. Twickenham M.B. (105); 66. Wembley M.B. (131); 67. Willesden M.B. (179); 68. Wood Green M.B. (52); 69. Enfield (110); 70. Feltham (44); 71. Friern Barnet (29); 72. Harrow (219); 73. Hayes and Harlington (65); 74. Potters Bar (17); 75. Ruislip and Northwood (68); 76. Staines (39); 77. Sunbury on Thames (23); 78. Uxbridge (55); 79. Yiewsley and West Drayton (20).

(*e*) *Hertfordshire* (*Part of*) (118)—80. Barnet (25); 81. Bushey (14); 82. Cheshunt (23); 83. East Barnet (40); 84. Elstree R.D. (14).

(*f*) *Essex* (*Part of*) (1065)—85. East Ham C.B. (120); 86. West Ham C.B. (170); 87. Barking M.B. (78); 88. Chingford M.B. (48); 89. Dagenham M.B. (114); 90. Ilford M.B. (184); 91. Leyton M.B. (105); 92. Walthamstow M.B. (121); 93. Wanstead and Woodford M.B. (61); 94. Chigwell (51); 95. Waltham Holy Cross (8).

2. S.E. LANCASHIRE

(*a*) *Cheshire* (*Part of*) (420)—1. Stockport C.B. (141); 2. Altrincham M.B. (39); 3. Dukinfield M.B. (18); 4. Hyde M.B. (31); 5. Sale M.B. (43); 6. Stalybridge M.B. (22); 7. Alderley Edge (3); 8. Bowdon (3); 9. Bredbury and Romiley (17); 10. Cheadle and Gatley (31); 11. Hale (12); 12. Hazel Grove and Bramhall (19); 13. Marple (13); 14. Wilmslow (19); 15. Disley R.D. (2).

(*b*) *Lancashire* (*Part of*) (2000)—16. Bolton C.B. (167); 17. Bury C.B. (58); 18. Manchester C.B. (703); 19. Oldham C.B. (121); 20. Rochdale C.B. (87); 21. Salford C.B. (178); 22. Ashton under Lyne M.B. (46); 23. Eccles M.B. (43); 24. Farnworth M.B. (28); 25. Heywood M.B. (25); 26. Middleton M.B. (32); 27. Mossley M.B. (10); 28. Prestwich M.B. (34); 29. Radcliffe M.B. (27); 30. Stretford M.B. (61); 31. Swinton and Pendlebury M.B. (41); 32. Audenshaw (12); 33. Chadderton (31); 34. Crompton (12); 35. Denton (25); 36. Droylsden (26); 37. Failsworth (18); 38. Horwich (15); 39. Irlam (15); 40. Kearsley (10); 41. Lees (4); 42. Littleborough (10); 43. Little Lever (4); 44. Milnrow (8); 45. Royton (14); 46. Tottington (5); 47. Urmston (39); 48. Wardle (4); 49. Westhoughton (15); 50. Whitefield (12); 51. Whitworth (7); 52. Worsley (27); 53. Limehurst R.D. (8).

3. WEST MIDLANDS

(*a*) *Staffordshire* (*Part of*) (815)—1. Smethwick C.B. (76); 2. Walsall C.B (114); 3. West Bromwich C.B. (87); 4. Wolverhampton C.B. (162); 5. Bilston C.B. (33); 6. Rowley Regis M.B. (49); 7. Tipton M.B. (39); 8. Wednesbury M.B. (34); 9. Aldridge (29); 10. Amblecote (3); 11. Brierley Hill (48); 12. Coseley (34); 13. Darlaston (22); 14. Sedgley (23); 15. Tettenhall (7); 16. Wednesfield (17); 17. Willenhall (30).

(*b*) *Warwickshire* (*Part of*) (1227)—18. Birmingham C.B. (1112); 19. Sutton Coldfield M.B. (47); 20. Solihull (67).

(*c*) *Worcestershire* (*Part of*) (193)—21. Dudley C.B. (62); 22. Halesowen M.B. (39); 23. Oldbury M.B. (53); 24. Stourbridge M.B. (37).

4. WEST YORKSHIRE

West Riding Yorkshire (*Part of*) (1692)—1. Bradford C.B. (292); 2. Dewsbury C.B. (53); 3. Halifax C.B. (98); 4. Huddersfield C.B. (129); 5. Leeds C.B. (504); 6. Wakefield C.B. (60); 7. Batley M.B. (40); 8. Brighouse M.B. (30); 9. Keighley M.B. (56); 10. Morley M.B. (39); 11. Ossett M.B. (14); 12. Pudsey M.B. (30); 13. Aireborough (27); 14. Baildon (10); 15. Bingley (21); 16. Colne Valley (22); 17. Denby Dale (9); 18. Denholme (2); 19. Elland (19); 20. Heckmondwike (8); 21. Holmfirth (19); 22. Horbury (7); 23. Horsforth (14); 24. Kirkburton (17); 25. Meltham (5); 26. Mirfield (11); 27. Queensbury and Shelf (9); 28. Rippondon (5); 29. Rothwell (24); 30. Shipley (32); 31. Sowerby Bridge (18); 32. Spenborough (36); 33. Stanley (16).

5. MERSEYSIDE

(*a*) *Cheshire* (*Part of*) (382)—1. Birkenhead C.B. (142); 2. Wallasey C.B. (101); 3. Bebington M.B. (47); 4. Ellesmere Port (32); 5. Hoylake (30); 6. Neston (9); 7. Wirral (17).

(*b*) *Lancashire* (*Part of*) (1000)—8. Bootle C.B. (74); 9. Liverpool C.B. (789); 10. Crosby M.B. (58); 11. Huyton with Roby (55); 12. Litherland (22).

6. TYNESIDE

(*a*) *Durham* (*Part of*) (321)—1. Gateshead C.B. (115); 2. South Shields C.B. (106); 3. Jarrow M.B. (28); 4. Felling (25); 5. Hebburn (23); 6. Whickham (23).

(*b*) *Northumberland* (*Part of*) (513)—7. Newcastle upon Tyne C.B. (291); 8. Tynemouth C.B. (66); 9. Wallsend M.B. (48); 10. Gosforth (24); 11. Longbenton (28); 12. Newburn (21); 13. Whitley Bay (32).

The writer is much indebted to Miss Anne H. Moore, Map Curator of the Oxford School of Geography, for help in the preparation of this paper.

SOME DEFINITIONS IN THE VOCABULARY OF GEOGRAPHY

THIS SECOND list of definitions by the British Association Glossary Committee deals with the vocabulary of land-form description. Most of these terms were first used by the great American pioneers of physiography, G. K. Gilbert, J. W. Powell and others, and their work was systematized by W. M. Davis in terms of an ideal sequence of forms passed through in the course of a "geographical cycle".[1] Although they may be used as descriptive terms, their use, even in description, must proceed within the framework of the genetic theory with which they are associated; their connotation cannot be purely descriptive.

Base-level. The level below which erosion is unable to proceed; the general and ultimate base-level for the land surface is sea-level, but other local or temporary base-levels may exist.

Cycle of erosion. The hypothetical sequence of changes or stages through which a land surface would pass in its reduction to *base-level* by the processes of erosion. The period of time taken by this process of reduction.

Stage. The *cycle of erosion* can be divided into early, middle and late stages; the surface features appropriate to each of these stages may be described as young, mature and old (or senile).

Peneplain. An almost featureless plain, showing little relation to structure, and controlled only by a close approach to *base-level*.[2]

Rejuvenation. The development of younger surface forms, appropriate to the earlier stages of the *cycle of erosion*, which occurs when a comparatively well advanced cycle is interrupted by an increase in the rate of erosion.

Knick point (German—*Knick-punkt*). A break of slope, particularly in a river *profile* (q.v.).

Monadnock. A residual mountain rising above a *peneplain.*

Profile. A vertical section drawn along any line on the surface of the earth and compared with a given datum level; in particular a section drawn along a river course, or across a valley or divide.

Aggradation. The process of raising a surface by the deposition of rock waste.

Degradation. The process of lowering a surface by erosion and the removal of rock waste.

Grade. A surface or feature (*e.g.* a river) may be said to be at grade, or graded, when neither *degradation* nor *aggradation* is taking place.

Profile of Equilibium. A term used for the *profile* of a graded river.

Pediment. An eroded rock platform of considerable extent at the foot of an abrupt mountain slope or face—characteristic of arid and sub-arid regions.

Scarp. An abrupt cliff-like face or slope terminating an elevated surface of low relief. In particular the steep contrary slope to the dip-slope of a gently tilted bed of resistant rock; the whole feature constitutes a *cuesta* or scarped ridge.

Escarpment. A general term for a continuous scarp face.

[1] W. M. Davis, "The geographical cycle." *Geogr. J.* 14 (1899) 481–504.
[2] *Ibid.*, p. 497.

Scarp land. A region characterized by a number of parallel or sub-parallel scarped ridges separated by vales.

Consequent drainage. A drainage system directly related to the initial slope of the surface.

Antecedent drainage. A drainage system maintaining its original direction across a line of localized uplift.

Superimposed (or *epigenetic*) *drainage.* A drainage system established on an upper rock-mantle of simpler structure than the underlying formations now exposed by erosion.

Subsequent tributaries. Tributaries developed under the guidance of weak outcrops or other lines of weakness (*e.g.* faults).

Obsequent tributaries. Tributaries developed in relation to a *subsequent* valley and flowing in a direction opposite to that of the *consequent* streams.

Insequent drainage. A drainage system developed under accidental controls of which no definite account can be given.[1]

[1] W. M. Davis, "The geographical cycle." *Geogr. J.* 14 (1899) 490.

FROM THE *JOURNAL* A HUNDRED YEARS AGO

THE *Journal of the Royal Geographical Society* for 1852 contained a paper by the Rev. D. Livingston and William Cotton Oswell on "Latest explorations into Central Africa beyond Lake 'Ngami" (vol. 22, pages 163–74). It relates to the second of Livingstone's great journeys of exploration, on which he first heard of the existence of the Victoria Falls, and from it the following extracts are taken.

"Before detailing the information which our two months' sojourn on the Chobé enabled us to collect, I may remark that the opening up of a path from either the E. or the W. coast to the centre of the continent—a prominent feature in all our plans—would be a worthy subject for the consideration of the Royal Geographical Society; and for such an undertaking I know no one better suited than my friend Mr. Oswell. He has courage and prudence equal to any emergency, and possesses, moreover, that qualification, so indispensable in a traveller, of gaining the confidence of the natives, which maintaining the dignity of a gentleman."

. . . . . .

"Respecting the sources of these rivers we are quite in the dark. The Makololo have ascended the Seshéké, or, as it is otherwise called, the Borotse River, at least 400 miles above the town to which our journey extended. Its general course may be inferred from their statement, that, when ascending it, "the sun rose on one cheek and set on the other". But some, in drawing maps for us, gave it a little Westing. In lat. 17° 21′ S. it contains a volume of water of from 400 to 500 yards broad, and though we saw white banks of sand in it, the depth was evidently considerable. The name Seshéké refers to these banks of white sand. Alligators and hippopotami abound in it. A series of rapids, situated above the town of Seshéké, compels the boatmen to drag their canoes some distance along the shore, and at about 80 miles below the same point a waterfall is reported, the spray and noise arising from which are so considerable as to have led to the name "Mosi oa tunya" (smoke sounding). The spray is said to be visible 10 miles off. This waterfall may have prevented the slave dealer from sailing up this river, which we believe to be the main branch of the Zambesi, for it is a fact to which all the natives bore uniform testimony, "*that the slave-trade only began on the Seshéké in* 1850". At the falls the river is narrowed by means of rocks. It soon, however, spreads out, and becomes placid again. The natives, who have been to the eastward, know of the Seshéké being joined by another river at about a month's distance from the town, which, beyond the junction, assumes the name Zambésa or Zambesi."

THE MUSLIM SUDAN IN THE MAKING

THE FUNG KINGDOM OF SENNAR. By O. G. S. CRAWFORD. *Gloucester: John Bellows* (for the author), 1951. 10×7½ *inches;* xxi+359 *pages; maps, diagrams and illustrations.* 55*s*

IT IS fortunate for African studies that Mr. Crawford was not deterred from writing this book by a doubt which seems to have occurred to him, as to whether the labour was proportionate to the result, and whether "three centuries of barbaric squalor" deserve the name of history. The British in the Sudan who collected manuscripts and recorded traditional lore and history have, as he reminds us, done better by their charge than the Romans who failed to render a similar service to the past of this island, squalid and barbaric as it must have appeared to them. But it is not only the African of the future who, as Mr. Crawford thinks, will be just as deeply interested in his own origins as we are in ours, who has reason to be grateful. With Sir Harold MacMichael's 'A history of the Arabs in the Sudan', 'The Fung Kingdom of Sennar' will rank as an indispensable source book embodying all the accessible evidence in the form of quotation, analysis, or reference. The title, moreover, does not do full justice to the contents, since much of the book consists of a detailed study of the historical geography of the northern Sudan from the days of Strabo and Pliny to the Turco-Egyptian invasion. In his analysis of the Arabic documents and the accounts of travellers the author has taken infinite pains to establish the chronology of events by means of elaborate cross-checks, and to identify the names of places and people. He has himself surveyed the ground and visited all the important sites, and the chapters devoted to the description of the country and the people form in effect a detailed geographical commentary on the source-documents.

Throughout its history the northern Sudan has been a last outpost of the Mediterranean world remotely connected with its culture but never of it or within it. The Fung Kingdom was a Muslim successor-state of Christian Nubia but it was never embodied in the Muslim *orbis terrarum* just as medieval Nubia had remained outside the confines of Christendom. The little we know of Fung history has to be pieced together from a variety of sources greatly differing in value. The caravan trade with Egypt which must have been quite considerable has left no traces in Arabic literature, nor are there any records of diplomatic intercourse between the Egyptian Government and its barbaric neighbour, unless such remain hidden in the archives of Cairo or Istanbul. Evliya Chelebi, the adventurous Turk who wrote a famous book of travels, claims to have visited "Foncistan" some time between 1669 and 1672, and it is undeniable that he shows considerable knowledge of its topography. Yet the fantastic details which he sets down with supreme effrontery bear little relation to attested facts, and if indeed he visited the Sudan, as seems probable, his account presents a psychological riddle. The relevant portion of the Chelebi's voluminous work lies hidden in the obscurity of the Turkish language, a fact which need not unduly distress the historian, though it might be regretted by the seeker after marvels and curiosities. A little light from the outside world falls on the Fung country near the turn of the seventeenth century when we have the records relating to the journeys of Poncet and Brevedent and the ill-starred mission of du Roule, and Mr. Crawford is particularly to be congratulated on rescuing from undeserved oblivion the Bavarian Franciscan, Theodoro

Krump. For the rest, until we come to the end of the eighteenth century, there is darkness dimly illuminated by brief Arabic chronicles and tribal traditions many of which have been recorded in the pages of *Sudan Notes and Records*; and something can be learned from Portuguese and Abyssinian sources. When European explorers of the stamp of James Bruce and Burckhardt appeared on the scene the kingdom had already reached the last stage of its decline and fall.

Most of the kings and vassal rulers listed in the chronicles remain shadowy figures and we learn little of political history. But there are many and curious details of the organization of the kingdom and of court ceremonial which deserve closer study than they have received, and fragmentary as the sources are, they enable us to form a fairly accurate picture of the land and the people and the conditions under which they lived. The Islamic factor as a social force is of great importance, because it was during the Fung régime that the northern Sudan became a Muslim country and acquired its distinctive character as a blend of Arab-Muslim and African elements. We fortunately possess an admirable account of the religious life in the 'Lives of the Scholars and Saints' by Muhammad Walad Dayfallah, a work completed early in the nineteenth century but based on earlier traditions and covering the whole of the Fung period. It is of surpassing interest as a picture of manners and incidentally throws some light on political history. As a source of Fung history it deserves fuller treatment than it has received in Mr. Crawford's pages.

The origin of the Fung has been hotly and inconclusively debated and Mr. Crawford devotes two chapters to the controversy, adding a new hypothesis to the theories put forward by others. The basic fact is that they were Blacks, for the people of the Sudan to this day speak of the dynasty as the Black Sultanate (*al-saltana al-zarqā*), and Canon Trimingham ('Islam in the Sudan,' p. 85) is probably right in saying that the word Funj, as he spells it, seems to be a political term denoting an aristocracy at Sennar and other centres and does not necessarily relate to any one race or culture. The search for their "origin" is likely to remain abortive.

The paucity of transmitted facts has left the field wide open for conjecture and ingenious combinations have been made on the basis of supposed linguistic evidence. Mr. Crawford, trained in the school of early British history, knows that identifications based on the similarity of ancient and modern names are hazardous, but he has not been sufficiently firm with scholars who have transgressed in this respect. Thus Burckhardt's guess that the Makaberab, an Arab tribe supposed to live between Damer and Shendi, are the Megabarri of the ancients is simply too good to be true. MacMichael, who quotes Burckhardt, does not list the Makaberab as a tribe or sept, a fact which throws doubt on the correctness of Burckhardt's transmission of the name. No case at all can be made out for connecting the Fung title *mangĭl* with Tuareg *amenokal* and the term Hamağ with Tuareg *amghi*. This last identification stands condemned by the fact that Hamağ, as MacMichael has already pointed out, is easily recognizable as an Arabic word meaning "uncivilized" or "of servile status," and that the use of the word is not confined to the Fung area. In justice to Mr Crawford it is to be noted that he quotes the conjectures of others without expressing wholehearted acceptance, but fanciful etymologies of this kind, reminiscent of Brutus the founder of the British race, hardly deserve mention in serious history.

Mr. Crawford's apologia for his spelling of proper names, unsatisfactory as he knows it to be, does not entirely disarm criticism. In quoting or summarizing the narratives of others he felt bound to adopt the spellings of the sources, with the result that the names of people and persons appear throughout the book in

an irritating variety of forms without the necessary corrective which might have been given in the form of a bracket or footnote. The distortions of which travellers are capable may be illustrated from such cases as Father Krump's *Maänschell* and *tubthamur* for *mangĭl* and *tób dammúr*, and Werne's [Ibrahim wad] *Fottil* which Mr. Crawford correctly identifies with Bruce's *Fidele* and which ought to be written Fadl. Not all his readers will easily recognize, as he does, that Caillaud's *Lod-Ag'uyb* stand for Wad Ağíb, and that *Chaouss*, the name of a Sha'iqiya "king" is nothing else than the Turkish military title *shawish*. It will be remembered that T. E. Lawrence was merely amused when the printer's reader pointed out to him that a name, probably intended for 'Abd al-Mu'ín, appeared in his script indifferently as Abd el Mayin, el Main, el Mayein, el Muein, el Mayin, and el Muyein. His comment was "Good egg. I call this really ingenious." Mr. Crawford's practice is not far removed from that of Lawrence though he probably does not wish to associate himself with his frivolity.

The author modestly calls his book a preliminary attempt at synthesis, and he points out that much is still to be done in all fields of research before the history of the northern Sudan can be written in a form approaching finality. He has no reason however to apologize for the shortcomings of his book, which are due to the nature of the materials at his disposal rather than to any other cause. The value of his book is enhanced by a number of excellent and well-chosen illustrations and sketch-maps, and by detailed analyses of the routes taken by early travellers. 'The Fung Kingdom of Sennar' has obviously been the labour of years, and its publication denotes a significant step in the elucidation of African history.

S. HILLELSON

AFRICAN GEOMORPHOLOGY

SOUTH AFRICAN SCENERY: a textbook of geomorphology. By L. C. KING. (Second edition, revised.) *Edinburgh: Oliver and Boyd*, 1951. 9×6 *inches;* xxxi+379 *pages; maps, diagrams and illustrations.* 45*s*

STUDENTS OF geomorphology, and all interested in the broader aspects of the geomorphology and scenery of South Africa, will welcome this new edition of Professor L. C. King's well-known 'Scenery of South Africa' nine years after the appearance of the first edition. Fortunately the volume covers also east and central Africa, for these different regions are complementary. The sub-continent offers magnificent scope for a work of this nature, and the author's excellent photographs of outstanding features, together with his descriptions, present a vivid picture of this great field.

The new edition is much revised, and in part re-written; the pages are increased in number from 340 to 379, the photographs and text figures increased from a total of 307 to 346, and a coloured erosion-cycle map of central and southern Africa is a welcome new feature. The high quality and the illustrative value of the photographs, most of them taken by the author himself, cannot be praised too highly, and the work as a whole is excellently produced.

The first 17 chapters, comprising 238 pages, provide a good general account of the principles of geomorphology, with special reference to South African conditions, while of the remaining 4 chapters, comprising 107 pages, the first is devoted to a general statement on the geomorphology of southern Africa, the second and third to a description of the geomorphological provinces of the Union of South Africa and South-west Africa, and the fourth to the territories of east and central Africa.

Since the issue of the first edition, the author and his research school at Natal University have published many valuable papers on the processes of erosion and on the development of South African geomorphology, and the results of this work are incorporated in the new volume. In the course of these researches many new conceptions have been advanced by the author; these have been highly stimulating and of great value to geomorphological theory and description; some of them touch on highly controversial matters, and it could not be held that these have so far gained complete acceptance.

The author has himself abandoned the Davisian theory of peneplanation in favour of his alternative theory of pediplanation. It will however come as something of a shock to most geomorphologists to find that, in his revised account of the general principles of geomorphology, the terms peneplane and peneplanation find no place in an otherwise very full index. Many would hold that while pediplanation, *i.e.* the formation of erosion surfaces by scarp retreat and concomitant production of pediments (p. 240), plays an important part in the formation of erosion surfaces, it by no means provides the whole explanation.

The author moreover advances his view that the main "4000-foot" surface of southern Africa (long described as the "mid-Tertiary" or "Miocene" surface) represents the surface of Gondwanaland at the time of the disruption of that ancient continent in the early Cretaceous, that the surface then stood at about 2000 feet above the sea-level of that time, and that the "African" surface (comparable with the surface long described as the "end-Tertiary") was then eroded relatively to the early Cretaceous sea as base level. A series of uplifts amounting to about 2000 feet during the Tertiary and post-Tertiary have given rise to the

relatively unimportant "Victoria Falls" and later sub-cycles, and raised the "Gondwana" surface to a total height of about 4000 feet.

The conceptions regarding the "Gondwana" and "African" cycles are on the grand scale and deserve careful examination, but many geomorphologists, particularly those with experience of eastern and central Africa, will feel that the reduction of the main cycles of Africa (apart from certain admitted "fossil" surfaces) to these two only represents an over-simplification. Of course, the erosion of each extended over a vast period of time, and the author contends, with reason, that each shows local stages induced by local movement. Few would however agree that all the high-level relict plateaus of Africa standing at 3000–4000 feet above the "4000-foot" surface, and often referred to as representing the "Jurassic" peneplane, are due merely to local upwarpings of the "Gondwana" surface in which the scarps have developed by erosion along the flanks. The horizontality, individual extent, and general distribution of many such plateaus do not support this view, although there are others, described by the author, which have doubtless arisen in this way.

On page 246 the author states that most of the bevelling of the "Gondwana" cycle was achieved between the early Jurassic and the early Cretaceous; from the relation of certain of these relict high-level plateaus to the Karroo and to the Cretaceous sediments, they were clearly eroded within these limits of time, and many geomorphologists would prefer to regard them as far older than the surrounding "4000-foot" surface rather than as part of the same cycle of erosion. There is indeed something to be said for the view that it is these high-level remnants rather than the surrounding plateau that represent the old Gondwana surface at the time of disruption.

Figure 60, page 248, shows "the evolution of the Luangwa Valley by faulting in Cretaceous times." The same cycle of erosion (Gondwana) is said to bevel the surrounding country, to lie beneath the Cretaceous gravels on the floor of the valley, and to bevel both gravels and upstanding hills. In view of the great depth of this and similar valleys, 2000 feet or more, this is perhaps an extension of the cycle concept that many geologists would find difficulty in accepting. There is an apparent inconsistency between this figure, which shows the Gondwana surface cutting across the Luangwa valley, and the erosion-cycle map, which shows here only the African surface. I understand from Professor King that the figure is intended to show conditions as they were in Cretaceous times and not at the present day.

There is however an important difference of interpretation involved which closely affects our understanding of the erosion history of this region. I gather that the author uses the term "Cretaceous fault" as synonymous with the terms "post-Karroo fault" or "Karroo boundary fault," and that he applies the term "Cretaceous rifting" to a structure such as the Luangwa Valley that is ordinarily described as a "Karroo trough fault," or "faulted Karroo syncline." Furthermore, he regards these faults as having let the Gondwana surface down into the rift. The downthrow in the Karroo trough-faulting was of the order of many hundreds or sometimes even thousands of feet and, as far as the reviewer is aware, the geologists who have described the numerous down-faulted Karroo blocks of central Africa have considered that they carried down with them great thicknesses of Karroo sediments; and that the first bevelling of these sediments with the adjacent gneisses occurred at a very early stage. Accordingly, where early Cretaceous sediments now lie on the floor of these great troughs, and there cut across important faults separating the Karroo from the pre-Karroo, they are there not because of a new system of rift faulting, but as a result of the deep erosion, in the earliest Cretaceous, of the Karroo sediments infilling these

troughs, and the subsequent infilling of the valleys by Cretaceous sediments. Subsequently to this infilling further bevelling took place, as shown by the author. The presence of early Cretaceous terrestrial sediments in the eroded Rukwa, Nyasa, Luangwa and Zambezi troughs, leading to the Cretaceous sea, indicates an important seaward drainage system at that time.

If this be admitted, then neither the regional bevelling of pre-Cretaceous times nor that of the post-Cretaceous is represented on the valley floors, and the widespread planation at about 4000 feet is a post-Early Cretaceous feature, carried originally across the sediments, while that at 7000 to 8000 feet, bevelling the Karroo trough faults of the Nyika Plateau and elsewhere, might well represent the ancient Gondwanaland surface.

Plate 174 shows the eastern side of Ruwenzori. The rolling plain (at 5000 feet) of the foreground is said to be the same as the surface which rises along the crest of Ruwenzori and ultimately, to the south, attains an elevation of 14,000 feet. This is far from certain, and further light on this question will doubtless be thrown by the recent expedition to Ruwenzori organized by Professor Kennedy and the Uganda Geological Survey. There is increasing support for the view that for a very long time the mountain has existed in the form of a great residual mass.

At the end of the volume there is a coloured erosion-cycle map of Central and southern Africa on the scale of 1 : 7,500,000. This is a valuable addition to the new edition, and the author is to be congratulated on its compilation. Professor King has simplified his task by regarding the more important surfaces of Africa as falling within two "composite cycles." Many of the plateau remnants of the sub-continent standing high above the "4000-foot" or "Gondwana" surface and described as "upwarped portions of the 'Gondwana' surface" are eroded on igneous rocks or other resistant formations that have withstood erosion for long periods. The Zomba and Mlanje high-level plateaus of southern Nyasaland, for example, standing at about 7000 feet, are eroded on separate intrusions of hornblende-syenite, which stand out abruptly from the surrounding plains of gneiss and schist lying several thousand feet below. The relation is clearly one of differential erosion; the hypothesis of upwarping is not necessary, and in any case it would be difficult to conceive of such solid masses forming the loci of upwarping. Similar remarks apply to the Nyika Plateau of northern Nyasaland, while the neighbouring Mafingi Plateau has been eroded on a thick band of steeply-dipping quartzite standing above a terrain composed largely of non-resistant phyllites. Again, geomorphologists familiar with the varied erosion surfaces of Uganda will scarcely be prepared for a representation which places them all within the one "African" cycle, apart from a few remnants of the "Gondwana" surface along the borders.

These are however differences in interpretation of the features observed which are inevitable in the present state of knowledge, and they do not in any way detract from the value of Professor King's stimulating work. This new volume will be a very welcome addition to the bookshelves of African and other geomorphologists as well as of more general readers. F. DIXEY

REVIEWS

EUROPE

A NATURAL HISTORY OF MAN IN BRITAIN By H. J. Fleure. *London: Collins*, 1951. $8\frac{1}{4} \times 6$ *inches;* xviii + 349 *pages; maps, diagrams and illustrations.* 21*s*

The first volumes of the *New Naturalist* series have been concerned with the birds, animals, flowers, structure and scenery of Britain. It is clear from the preface that the editors of the series believe that man "must be regarded as one with nature" and their idea of adding a volume on man has proved very successful. They invited Professor H. J. Fleure to write a book with the title they had chosen and his varied training and long experience as archaeologist, geographer and anthropologist well fitted him to carry out the difficult task.

The first seven chapters consist of the early history of man in Britain down to the year 1066. Then, after a long introduction to modern times, separate chapters are devoted to the people, their clothes, dwellings, villages and hamlets, towns, churches and castles, and communications. A final chapter on the history of the growth of population concludes the volume. The treatment is primarily historical and is concerned with what Professor Fleure calls the "folk-life" of the country. Indeed the book is very largely a social and economic history and will probably be more valuable to a naturalist than a purely "natural" history could have been. This book is mainly a compilation of material from a great variety of sources which are acknowledged in the text and in a full bibliography, but in the chapter on the "People" Professor Fleure includes the valuable results of recent original work of his own. Perhaps the book suffers by its very comprehensiveness; the blending of physical and human material sometimes results in lack of coherence and makes difficult reading.

Professor Fleure brings his work up to the present day and his comments on recent developments are always interesting; he enables the reader to see recent history in its true perspective against the background of the millenia of prehistory. "The quickening of the pace of change," he writes, "is perhaps the most salient fact of our time. We 'plan' and want to see results ourselves. Rarely do we realize that this haste, however inevitable we may have made it, is a new and dangerous portent in the realm of the natural history of man."

As in the other volumes of the series, a fine collection of colour and monochrome plates adds to the pleasure of the reader. E. W. G.

HERDSMEN AND HUNTERS. By T. C. Lethbridge. *Cambridge: Bowes and Bowes*, 1950. $7\frac{1}{2} \times 5$ *inches;* 146 *pages; maps and illustrations.* 10*s* 6*d*

Mr. Lethbridge writes, in the words of his sub-title, of "Celtic seafarers in the Northern Seas." It is not a detailed book on Scottish, Icelandic or Eskimo archaeology—indeed the time is not ripe for an exhaustive treatment of those aspects of British and Arctic archaeology in which the author is interested. Instead he has given us some racily written and discursive chapters on such subjects as the prehistory of Western Scotland, the Celts in Iceland, the sea route to Greenland, and the relations of Norsemen, Celt and Eskimo in Greenland. He writes in an intensely personal and deliberately iconoclastic style which is refreshing and stimulating, the more especially when one remembers that he also writes with a personal knowledge of all the countries he is describing. The book is well illustrated by Mr. Lethbridge's own maps and drawings.

We may not agree with everything in this book, and I suspect that we are not meant to agree with many statements which are thrown out as challenges to complacent thinking, but no one can fail to find it full of new and interesting ideas—the suggestion, for example, that the Portuguese *saveiro* is a survival of Mediterranean boats in which the megalith builders travelled to the British Isles and Scandinavia; or the well-reasoned argument for the authenticity of the Kensington Stone; the suggestion also that Wineland may not lie on the eastern coast of America but may have been reached by way of Hudson Bay. There is too the vivid account of how Bronze Age men might truss and smoke the corpses of relatives and friends, and take them about strapped on ponies until they could arrange burials in traditional burial grounds. G. E. D.

A PALAEOGEOGRAPHICAL ATLAS OF THE BRITISH ISLES AND ADJACENT PARTS OF EUROPE. By LEONARD J. WILLS. *London: Blackie*, 1951. 9×11 *inches;* 64 *pages; maps and diagrams.* 21*s*

Professor Wills has always claimed that geology should be the geography of past times and, since a geographer can do little without a suitable map, it is natural that he should try to produce maps of the geography of past geological times. The surveyor may claim that his maps have a high degree of accuracy, but it is not so many years since even geographers produced maps lacking in precision, and in examining these palaeogeographical maps one must not expect an accuracy of the order of a modern survey.

The drawing of a palaeogeographical map on the blackboard is often one of the best ways of showing a class how the distribution of sediments is controlled by the distribution of the land areas of the time. Most teachers of stratigraphy do it, but they take care to rub the blackboard clean when the lecture is over. Is this an act of cowardice? Frequently it is; for they know the map cannot be accurate and they do not wish the firm line on the board brought up as evidence that they were wrong as soon as some new fact comes to light. A good palaeogeographical map does bring into focus all the known facts, and presents them as a clear picture of the distribution of land and sea in a way no other method can hope to do. Such maps are therefore of the greatest value if treated as they should be and not taken to be more than an interpretation of known facts, combined with a certain amount of justifiable inference.

It must be borne in mind that the notes accompanying Professor Wills' maps are from only a selection of the works which have been consulted, and that the maps themselves represent the considered opinion of a man who has spent nearly all his life as a teacher of geology. But, as he says in his preface, each map is to be considered as an Aunt Sally rather than as a Delphic Oracle.

Let us remember that it is so easy to find fault with a palaeogeographical map that it takes a courageous man to print one. Here are the firm lines for anyone to find fault with; Professor Wills has taken the risk and we are grateful to him for doing so. Let anyone who wants to criticize read his preface first.

W. B. R. K.

THE PALAEOGEOGRAPHY OF THE MIDLANDS. By LEONARD J. WILLS. *Liverpool: University Press* (*London: Hodder and Stoughton*), 1948. 8½×6 *inches;* vii+144 *pages; maps, diagrams and illustrations.* 10*s* 6*d*

Professor Wills likes to think of geology as the geography of the past and, in compiling a short handbook of the geology of Midland England designed to incorporate the results of recent research, he naturally takes a palaeogeographic view. His chapters follow a chronological sequence but coincide neither with the familiar geological systems nor the marine and continental phases which he

emphasizes. There are too many interruptions by chapter headings, tables, lists of localities and references, for the narrative to gain any impetus (and in places it is downright scrappy) except in the sections on the New Red Sandstone and the Glacial Drifts. Yet the book is valuable, even to geographers without a special interest in either geology or the Midlands. It reveals clearly the fascinating detective work that constitutes modern stratigraphy and it gives a strong incentive to the study of local geology by showing how its detailed findings throw light on, and are illuminated by, our knowledge of earth history in its wider aspects. Geographers might have been encouraged to go into the field with this book if its barren lists of "Localities worth visiting" had been replaced by an appendix describing in some detail what is to be seen at certain selected key localities. The amateur might then have seen through the eyes of the professional expert.

Geographers will find fault with some of the statements made by Professor Wills in describing the geographical conditions he infers: thus the surface waters "of the present-day Doldrums" are not "choked with drifting weed" (p. 9) and lateritic soils are not produced in a semi-arid climate (p. 28); and probably botanists and archaeologists will agree with the reviewer that the closing sentences form the most infelicitous ending to a work of scholarship that they have met. D. L. L.

ASIA

L'AVENIR DE L'ASIE RUSSE. By FÉLIX LEPRINCE-RINGUET. *Paris: Flammarion*, 1951. $7\frac{1}{2} \times 5$ *inches;* 244 *pages; maps.* 480 *fr.*

L'ASIE SOVIÉTIQUE. (Compiled by L'Institut National de la Statistique et des Études Économiques). *Paris: Presses Universitaires de France*, 1949. $9\frac{1}{2} \times 6\frac{1}{2}$ *inches;* 232 *pages; maps and diagrams.* 500 *fr.*

M. Leprince-Ringuet's volume consists of 238 pages of concise and balanced information on the whole of Soviet Asia, from the Urals to the Amur, and from the Caucasus and Pamirs to the Arctic. It is well compiled, factual and statistical, supported too with small sketch-maps in the familiar tradition of French mapping for books. The book is not so much a pointer to the future of these immense stretches of the earth's surface as a journalist's *vade mecum* for the present, culled (one feels) from the library, and not shot through with actual experience.

Useful stress is laid on the contrast between Russia in Europe and in Asia, the former with three times the population of the latter, the latter with three times the extent of the former. "L'Asie russe est pour la Russie d'Europe beaucoup moins un territoire du peuplement, qu'un réserve énorme de matières premières indispensables à l'industrie." While pointing out that Russia's industrial level lags sadly behind that of the North American continent, the author draws interesting comparisons between the two, and observes that it is in Asiatic Russia that the Soviets are striving all they know to build up an inexpugnable industrial arsenal behind a screen of deserts and mountains. But this transformation has been achieved at a cost in human suffering that cannot be measured, caused by "transferts de populations effectués de la manière la plus brutale, malgré l'opposition des populations, et ceci jette une ombre très fâcheuse sur le succès industriel."

As the work of a mining engineer, the book gives considerable detail of mineral exploitation and metallurgical achievement. On agriculture and irrigation it is less convincing. While omitting details of projects actually being undertaken in the irrigation field, *e.g.* the Karakum and Turkmenian canals from the

Amu Darya, the author outlines the fantasy of J. Davidov for the re-routing to the Aral and the Caspian Seas of a great part of the waters now flowing to the Arctic in the Ob and Yenisei. This would involve the building of a 250-foot barrage several hundreds of miles in length to impound the upper waters of the Arctic rivers in marshes of size comparable to the North American lakes, and draining them by a canal of unheard-of dimensions into the Aral basin, and thence by the old bed of the Oxus (Amu Darya) to the Caspian Sea. The scale of the conception, and indeed its reality, emerges from the fact that Davidov speaks in terms of cubic *kilometres* of water. Experience suggests that, were it indeed possible to inundate the Turanian basin in this fashion, the absence of drainage in a land-locked inland river system would produce either a larger Caspian, or a saline desert worse than the present sands of the Karakum.

The author does well to stress (pp. 126–133) the failure of Soviet methods to develop a satisfactory system of stock-breeding. The reasons are not far to seek.

There are many errors which tend to weaken confidence in the author's presentation of facts. On page 9 the dates of Chenghiz Khan and of Timur are given a century wrong in each case. On page 213 the reader has to infer that Teheran is connected with the Russian railway system via Tabriz (in fact the Russian gauge reaches to Tabriz: the Persian system on the European gauge has not yet got beyond Mianeh). Again the rail network map on pages 6 and 7 wrongly shows the Farghana loop as linked with the railway via Termez into Tajikistan, while in fact it joins the main line between Tashkent and Samarkand. Page 212 suggests that railway communication between Soviet Armenia and Turkey is easy, whereas in fact there are two changes of gauge, and one of the worst 2 foot 6 inch narrow-gauge lines in the world between Erzerum and Sarikamish. In a table of changes of Russian place-names made to satisfy ideology we find the old name of Srinagar to have been Kashmir! The stories on pages 215 and 219 of eager parties of British and Americans entering Sinkiang, presumably from India, during the Second World War to build air-bases and prospect for minerals, and of the arrival of Russian geologists on Lake Manasarowar in Tibet in flying-boats in 1947, are reminiscent of the methods of the news-letter writer.

'L'Asie Soviétique' eschews this method, and is a frank statistical blue-print, well furnished with references to the Soviet Press, although the references are seldom specified. As in the case of all tables based on Soviet statistics, the compilation suffers from the propagandist methods of the source, combined with that source's effort to discourage "the lust of knowing what should not be known." Both this compilation and M. Ringuet's book decide, for some reason, to exclude Kazakistan from Soviet Central Asia, handing it to Siberia and the Urals. Yet the lower Sir Darya, Alma Ata, and the Jungarian Gates are just as much parts of Central Asia as are Farghana, Tashkent, Samarkand, or indeed Sinkiang.

On pages 204–205 of 'L'Asie Soviétique' is a statement, unsupported by any information so far as I know, that a trunk railway is under construction along the eastern coast of the Caspian from Guriev to Krasnovodsk. This idea seems to arise from a confusion with the Oxus Valley line northward from Charjui, long planned but only seriously began in 1947, due to be finished in 1950 (but possibly not finished yet). For the present, this line is not conceived as going farther north than Kungrad near the southern end of the Aral Sea.

Both these publications, like so much else about Soviet Asia, are really geographical, industrial and agricultural surveys; they shy away from the intimate affairs of men. The great Turco-Iranian civilizations of Samarkand, Bukhara

and Farghana are a closed book to the writers, and the clash between these civilizations and the Russian imperialist roller—Tsarist and Soviet—awaits a more personal and a deeper treatment. O. K. C.

VOYAGE AUX INDES. By ANDRÉ SIEGFRIED. *Paris: Armand Colin*, 1951. $7\frac{1}{2} \times 5$ *inches; 160 pages; maps. 280 fr*

André Siegfried visited India in 1900 and again in 1950 and this little volume is a collection of articles contributed to *Le Figaro* during the latter journey. It was India without the English that M. Siegfried came to see and he found the two nations of today very conscious of their new independence, yet with the British machinery of government still the backbone of the administration. He reiterates the advantages to all concerned in the wisdom which led both India and Pakistan to remain within the Commonwealth, and with so little obligation to themselves; but he arrives at the questionable conclusion that ours was "a retreat in good order to carefully prepared positions" (p. 117). He assesses the personalities of the new leaders of the two states and the economic and political problems that face them, in particular the menace of Communism. Russia, though feared, enjoys a measure of popularity as a champion of Asia against the West and as an example of the successful modernization of an almost medieval State. To some, he says, Communism offers India a way of liberation from the immemorial fetters of her own traditions.

The author's main interest is in the political situation, but he does not miss geographical factors and has an eye for the widely differing landscapes of the peninsula. Delhi, the seat of the Moghuls, is now an inappropriate capital but has all the apparatus of administration; Karachi, preferred to Lahore because that town lies too near the unquiet frontier, possesses none. Calcutta and Bombay are the creations of the English and look outwards to other lands. Bombay is mid-Victorian; "si vous connaissez à Londres le quartier de Kensington, Cromwell Road, Queen's Gate, l'Albert Memorial, le Kensington Museum, vous connaissez Bombay, avec cette réserve qu'on y discerne un courtois effort d'orientalisation."

Two interesting chapters deal with Pondicherry and Goa, the latter almost more Latin than Indian. 'Voyage aux Indes' is a thoughtful and entertaining commentary on the Indias of today. F. G.

AFRICA

APPRENTICESHIP AT KURUMAN: being the journals and letters of Robert and Mary Moffat. Edited by I. SCHAPERA. (Central African Archives: Oppenheimer Series No. 5.) *London: Chatto and Windus*, 1951. $10\frac{1}{4} \times 7$ *inches;* xxxii + 308 *pages; map and illustration.* 30*s*

Happy is the land that early acquires a sense of history, and happier still when the men and money are available to write it down and publish it. Southern Rhodesia, barely sixty years of age, is blest with these possessions and in this latest volume, in the well-known Oppenheimer Series, the Archives at Salisbury have yielded up more treasure from the busy pens of Robert Moffat and his wife. The Chief Archivist did well to select in Professor Schapera a man who knew the country and who could, better than anyone, follow the intricacies of spelling and naming and the obscurities that abound in personal letters. The historical value of these journals and letters lies chiefly in the fact that they were written by one who was close to the group of missionaries, headed by Dr. John Philip whose political activities were to shape the future of South Africa so markedly, though in general Moffat did not approve of these activities.

In the hands of an editor with such thorough knowledge of the tribes concerned, the tangled story of the successive raids from eastern peoples, Zulus and Basutos, on the less warlike Bechuanas begins to take shape. Moreover the part which a handful of missionaries played in saving Bechuanaland from the Bantu on the east and from the Griqua freebooters on the south is now clearly interpreted.

Copious annotation was necessary, which makes the volume a source of precious information but, naturally, less easy to read. Yet one soon shares keenly the fears, the hopes and the satisfactions of this rigid missionary and his most admirable wife. It was a period of apprenticeship indeed, but he had no foreman to advise him, and only steadfast faith in his purpose to keep him at work in such a dangerous locality. It is clear however that had Dr. Moffat been in any less remote place, or in any closer association with Dr. Philip whose preoccupation in the political field would have led to Moffat's going elsewhere, there would have been a very different history for Bechuanaland and Matabeleland. As it was there were frequent disputes between the two men, each possessed of a strong personality and neither gifted with an excess of diplomacy.

The volume is a very worthy successor to those which have already been published in the series and will be an invaluable source-book to the historians of the future. With a format so excellent and footnotes so precise and authoritative it is a disappointment to find that the only map included is poor, without a legend and of small scale. Certainly to geographers, and probably to the general reader, a series of large-scale maps for which there is now ample material would have illuminated the text and put this volume in the very first rank. F. D.

AMERICA

HUDSON'S BAY TRADER. By Lord Tweedsmuir. *London: Clerk and Cokeran, 1951. 9×6 inches; 176 pages; illustrations and end-paper maps. 15s*

The first interesting point in Lord Tweedsmuir's book is why he went to the Arctic—for his health. He had left Africa as an apparently incurable sufferer from amoebic dysentery, with, as he says, an expectation of life limited to months. A single northern winter cured him. He says no more about this; but it is another piece of evidence to make one wonder how long it will be, in these days of easy travel, before curative advantage is taken of the sterilized and stimulating Arctic air.

But the main interest lies in the theme of the book. It is not a record of Arctic exploration and adventure. It is a personal, work-a-day account of a routine job by which thousands of people earn their daily bread. The author was a junior employee in a very large organization. He was one of the two members of the Hudson's Bay Company at Cape Dorset in Baffin Land, with the duty of trading for furs with the Eskimos. Of course the romance of such an unusual place of business obtrudes itself—to the reader's advantage. But there are no trimmings to this book. Its title, 'Hudson's Bay trader,' fits it exactly.

The trader goes to his new post by ship. His fuel, food and the trading stores go with him. He puts his house in order before the ground freezes. Besides, there is seal and walrus meat to be laid in for dog food. With the coming of winter there are the trap lines to be set and watched. Throughout there is the slow and patient business of trading with the Eskimos. Skins have to be stretched and local journeys made. The winter is far from being a period of

idleness. Then comes the messy Arctic spring, the packing of bales of furs, and preparing for the coming of the ship.

It is interesting to learn that the Eskimos (in other parts of the Arctic, Greenland for instance, so very far from businesslike or frugal) have in Baffin Land been educated to receive an advance of royalties in the form of stores and work it off by trapping. There is much of interest in the book, but it does strike the reviewer that it might have been still more interesting. The author says that "it was never written to be published" and, since it has been published, that is a pity. It is written as a diary, a form easy for the writer but generally unsatisfactory for the reader. There is too much detail, too little general description, and a lack of finish. The evident genuineness of the day-to-day description scarcely compensates for this.

How good it might have been one gauges from the preface, which was of course written for publication. This is first class and gives a clear and intriguing picture in a few hundred words. If Lord Tweedsmuir had not felt bound to retain the integrity of his daily notebook the rest of the book might have been of the same standard and more satisfying. J. M. S.

LOST CITY OF THE INCAS. By HIRAM BINGHAM. *London: Phoenix House*, 1951. 8½×5½ *inches; 224 pages; map and illustrations.* 21*s*

Mr. Bingham tells us that in 1911 when his adventure began he was a geographer turned archaeologist. Now forty years later he retells the story in the light of further discovery and experience, and convinces us that he remains unchanged. The geographer is everywhere apparent, climbing, mapping, discussing the natural resources and the people of the land he is exploring, and doing it with a sense of the wonder of the natural world and a love of his region of exploration which is infectious. This book is far superior to his earlier accounts of the subject. As a study in human geography the city of Machu Picchu, built in granite on a mountain where only the narrow paths used by Indian carriers gave access, where every square yard of cultivable ground was laboriously terraced, reflects the lengths to which men will go to preserve their way of life even in the most difficult circumstances.

From the archaeological point of view it is high time that a readable account of the cultures of ancient Peru was given to our public, and Mr. Bingham's study is a step in this direction, though he does include one error in ascribing the *bolas* to the Peruvians.

His study of the relations between Spaniards and the Inca in the two generations after the Spanish Conquest is of importance to all students of culture contact. The chapter on this subject ends with the death of the last Inca; but readers may note with some relief that the Inca nobility lived on in great respect in Peru and wore their own ceremonial costume on great occasions until the eighteenth century. The author is to be complimented on not pressing his suggestion that Machu Picchu was a pre-Inca site of immense historical importance. And this is most unlikely, as no pottery from the city has been in any but the purest Inca period styles; there is nothing to cover the period of Tiahuanaco culture which corresponds to the time of Montesinos' "Amautas," nor is there any sherd of the "Pucara" culture which followed the fall of Tiahuanaco and the rise of the Inca family at Cuzco.

This book is well worth reading for all who are interested in South America, and for all who like a different kind of travel book written with the gusto of a man in love with his subject. C. A. B.

PACIFIC

NEW HEBRIDES PAPERS: Scientific results of the Oxford University expedition to the New Hebrides 1933–34. *Oxford: University Press*, 1951. 11×7½ *inches; maps, diagrams and illustrations*

The Oxford University Exploration Club organized an expedition to the New Hebrides in 1933–34 and the offprints of sixteen scientific papers published in various journals between 1934 and 1947 are here bound together, with a preface and table of contents. The collection includes two papers from the *Geographical Journal*, on the islands of Esperitu Santo and Malekula respectively, and the remainder are mostly special studies in zoology and botany.

One of the main objects of the expedition was to climb the highest mountain in the New Hebrides, but the other was to study the biological response to the scarcely perceptible alternation of seasons in the tropical rain forest; and to this end very complete meteorological records were maintained which cannot but be of value to climatologists. The methods and results are fully described. Meteorological observations which are confined to the relatively short stay of a single expedition are seldom of permanent value and it is in such a case as this, where they bear on a particular phenomenon and are related to the other scientific work of the expedition, that they are well worth while. F. G.

PHYSICAL GEOGRAPHY

PHYSICAL GEOGRAPHY. By ARTHUR R. STRAHLER. *New York: John Wiley* (*London: Chapman and Hall*), 1951. 11×9 *inches;* x+442 *pages; maps diagrams and illustrations.* 48*s*

Geographers have been well catered for in recent years by their colleagues and publishers in the United States and this book is a new compilation produced in the now familiar American style. The work is intended for college and military students and the scope of "physical geography" has been interpreted along very broad lines so that we not only find a systematic treatment of the elements of geomorphology, climatology, meteorology and hydrology, but also chapters upon the form of the earth, earth movements, time, map projections, maps, survey and soils. Each chapter is terminated by a series of review questions, and a select bibliography comes at the end of the book. The treatment of some topics necessarily becomes superficial but much is conveyed by the diagrams with which the book is profusely illustrated. There are over 500 illustrations of an excellent quality, many of which have not hitherto appeared in print.

Outside the dollar area the price will inevitably restrict the circulation of this work amongst students but it should certainly be included in any reference library of physical geography. W. G. V. B.

GEOMORPHOLOGIE. By FRITZ MACHATSCHEK. *Leipzig: B. G. Teubner*, 1949. 9×6½ *inches;* 164 *pages; maps, diagrams and illustrations.* $2.35

When the second edition of this book was reviewed by Professor J. A. Steers in the *Journal* (85 (1925) 199–200) he described it as "an excellent revision book for a student who has attended a course in physiography and who wants to see the whole subject set out in a clear form but in limited space." It is doubtful if even this limited praise is justly applied to the third and fourth editions. The whole book has been re-set in new type but, apart from small verbal changes and a few additions to the capriciously selective bibliographies, no attempt has

been made to bring it up to date. Thus the work of P. Jovanovic (1940) on river profiles is cited in a bibliography but his highly novel ideas receive no mention in the text, while the writings of Kesseli, Mackin and others in the same field, and even G. K. Gilbert's classic Berkeley experiments, receive no mention. In connection with the arid cycle, papers by Gilbert (1890), Russell (1895), McGee (1897), Keyes (1912) and Lawson (1915) are cited, but there is no sign of awareness of later work by Blackwelder, Kirk Bryan, D. W. Johnson, Bailey Willis or others. Machatschek is similarly unaware of the work of C. F. Sharpe on mass movements, or of R. F. Flint's 'Glacial geology and the Pleistocene epoch.' Even the general works by Lobeck, von Engeln and C. A. Cotton are ignored. Finally, though there has been some substitution of half-tone illustrations, all the old (and in many cases archaic) line diagrams have survived. Notable among these are two quite ridiculous sections from Wales to London and across the Weald which are best described as travesties of sections drawn eighty years ago by Sir Andrew Ramsey. It is doubtful if this book now has any real value to the British or American student. D. L. L.

THE WEATHER. By GEORGE H. T. KIMBLE. Second edition. *London: Penguin Books*, 1951. 7×4 *inches; 256 pages; diagrams and illustrations.* 3*s*

With minor changes, the general arrangement of this useful little book remains the same as in the first edition[1]; but there is an appreciable enlargement due chiefly to the addition of two chapters on the current topics of climatic change and the artificial control of weather. It remains a fund of weather wisdom, theoretical and practical, passed on to the reader in an amusingly cynical style. Many an unwary walker in the Welsh hills and the Lake District, says the author, might have averted an untimely end by the application of a little knowledge easily obtained as to when the dew point in the morning is high enough to make it likely that extensive sheets of low stratus cloud will envelop the mountains during the day.

The first edition contained an error about the rainbow which has now been corrected, but unfortunately another error in the optical field has taken its place. In the first edition it was implied that green sky at sunset, though not often seen, does occur and is usually regarded as a sign of rain; in this edition it is stated that green sky is hardly ever seen and it is, moreover, confused with the quite different phenomenon of the "green flash" at sunset (p. 129). The reviewer has often seen patches of green sky towards sunset, especially during the long-drawn light of the midsummer months. Rifts of greenish sky are also quite often to be seen in England during stormy Atlantic types of winter weather and it may be suspected that glaucous patches are common over mid-ocean.

The statement that, despite tradition, snow at Christmas is much less likely than in the New Year is too loose and invites comment; it is questionable whether any particular date in January or February is much more likely to bring snow than December 25. Though it is true that genuine White Christmasses have been much rarer in this century than in the last, partially white Christmasses with enough snow locally up and down the country to keep the tradition alive have not been infrequent; in some years, as in 1950, the Christmas scene has occurred well before the festival. And if we agree with Dr. Kimble that a White Christmas is "unseasonable" in a statistical sense, there is surely another sense in which—with deep snow and hard frost coinciding with the shortest and darkest days of the year—it is most impressively seasonable.

L. C. W. B

[1] Reviewed in *Geogr. J.* 103 (1944) 185–6.

HUMAN GEOGRAPHY

REGIONALISM IN AMERICA. Edited by MERRILL JENSEN. Madison: University of Wisconsin Press, 1951. 9½×6½ *inches;* xvi+425 *pages.* $6.50

This volume is a collection of fifteen essays originally delivered as lectures to a conference on American regionalism held at the University of Wisconsin in 1949. Good bibliographies accompany each chapter, but the book has no index. The first group of papers deals with the history of the idea of regionalism in the United States since the eighteenth century; all the authors and especially the historians make it clear that "region" has meant different things in different academic disciplines and to administrators. Professor Fulmer Mood's long chapter on "The origin, evolution, and application of the sectional concept, 1750–1900" is one of the most valuable in the book. He gives a careful account of the meaning and use of the words "section" and "region" at different dates, paying special attention to J. W. Powell's monograph 'Physiographic regions of the United States' (1896) and showing its importance in the history of American regionalism. It is especially interesting to see the influence of this classic paper on the early thought of the historian Frederick J. Turner, whose later work on the significance of sections in American history was to become so famous. Professor V. Carstensen's essay on the development of the regional idea in the twentieth century includes a full consideration of the constructive work of geographers like W. L. G. Joerg and N. M. Fenneman. Professor R. B. Vance also pays much attention to the work of geographers and firmly states his belief that "no region can be defined except in relation to the total structure of which it is a component part."

The second part of the book deals with three historic regions of the United States. Professor F. B. Simkins' attractively written chapter on the South is accompanied by a full bibliography in which he asserts that "the best way to know the South intimately, apart from living there, is to read the social novels about the region." The Spanish south-west is treated by Dr. J. W. Caughey as an example of subconscious regionalism. He points out that while millions proclaim that they are Californians or Texans no one boasts that he is a south-westerner; yet the writer believes that a greater consciousness of its regionalism would help the south-west. Dr. L. Pollard in his chapter on the Pacific north-west, the "new" region of the United States, elaborates his opinion that many factors have greater importance in the creation of regions than the purely geographic ones. "Geographic determinism," he writes, "is not the explanation of regions."

The third group of essays describes regionalism in American culture; in literature, painting, architecture and linguistics. While it is true, in the words of E. P. Richardson who writes on painting, that there is no automatic connection between rivers, mountains or plains and the imaginative life of man's mind, the chapters on literature and architecture do demonstrate the influence of environment on these two arts. The chapter on linguistic regionalism, with its map of speech areas of the Eastern States, will interest English readers who may not have been aware of the great linguistic differences in America. The fourth part of the book shows the practical value of the regional idea in public administration. There are accounts of the Tennessee Valley Authority, of the regional problem of the Great Lakes cutover area, and an analysis of the projected Missouri Valley plan. In each of these examples it is possible to see, in the words of Professor F. J. Turner, "what are actually the natural regions in human geography as shown by human action."

The final chapters give the opposing views of two scholars. Professor L.

Wirth is critical of the regional idea and discusses its limitations. His paper is a warning against "the naïve acceptance of regional definitions based upon a one-factor criterion, and even more against the disposition to accept boundaries, when once defined, as permanent." Professor H. W. Odum is well known as the joint author, with H. E. Moore, of 'American regionalism' (1938) and, in the concluding chapter, he sums up the value of regionalism as a tool of research, as a method of interpretation, and as a means of public administration. Perhaps the most extraordinary fact about this invaluable book is that not one of its chapters has been written by a professed geographer; yet the understanding of the geographical contribution to the theory and practical application of regionalism is complete. The authors realize that regional geography is the work of the artist as well as that of the scientist. There have recently been several facile and jejune attempts by some American geographers to decry the whole regional idea and to proclaim its inadequacy; British regional geographers will be glad to learn that a large body of American historians, sociologists, men of letters and administrators fully appreciate the place of geography in the theory and practice of regionalism and in regional culture. E. W. G.

INTRODUCTION À L'ÉTUDE GÉOGRAPHIQUE DE LA POPULATION DU MONDE. By PIERRE GEORGE. *Paris: Presses Universitaires de France*, 1951. 9½×6 *inches;* 284 *pages; maps and diagrams.* 600 *fr*

Demographic problems are sometimes assessed as being the most pressing of the fundamental factors leading to political instability. Yet demographic studies have frequently been published which fail to be more than statistical and ignore the geographical outlook even though it may reasonably be expected from the nature of the problems. Here is a study, on a marginal topic, which has the quintessence of geographical outlook and expression. The volume is divided into two parts; the geographical distribution of population, and the various types of distribution. The first part begins with an evaluation of official statistics and here it is appalling to see that, for at least one-third of the world, population investigators are without reasonably reliable statistics and the task of elucidating changes is complicated. Professor George provides a most striking pair of diagrams: the one showing the countries of the world diagrammatically by area and the other by their estimated populations in 1950. Antarctica disappears, Canada, Australia and Africa shrink; and India, China, Java and Great Britain expand in this visual impression. The Old World is still dominant in the population diagram.

Analysis is carried further by the correlation of climatic types with numbers of people but, as the author rightly points out, this cannot tell the whole story for different systems of agriculture may give variations of population density. A discussion follows on the value of population densities for demographic study and on how, with small units such as the communes of France which are based on ancient units related to geographical features, they may be of significance. Climatic effects are treated first from the point of view of those that repel human settlement (cold and aridity) and then the indirect climatic effects which affect production and disease. Wherever this volume is opened—emigration, demographic analysis, population of industrial regions, rural and urban population—there is the same clarity of vision and inspiration. Not all that is treated is geography, but all is handled in a style which should stimulate research, not only in France but wherever this work penetrates. A. C. O.

GENERAL

HUGH ROBERT MILL: an autobiography. With an introduction by L. DUDLEY STAMP. *London: Longmans*, 1951. $8\frac{1}{2} \times 5\frac{1}{2}$ *inches;* xii + 224 *pages; illustrations.* 18*s*

There are not many who have ability and opportunity to write autobiographies, and also have previously had the patience to keep a diary over a long term of years. Among the few was the late Dr. H. R. Mill, and the sole regret felt by the present reviewer after reading it is that his autobiography is not twice as long. For it is of absorbing interest, and will be more and more so as the immense developments in British geography which have matured within the past century come into perspective.

His sketch of his ancestry and parentage is a model of its kind. He did not see himself as a geographer from the first, but geography was in his blood, inherited in particular from his mother who showed him how to love his native county of Caithness, and led him while he struggled against ill-health during youth to read of foreign lands and travels. In later life he had a good deal of opportunity to travel and the pure joy of it is fully revealed in the last chapter of his book.

On entering the University of Edinburgh he chose chemistry as his principal subject, and to the end of his life believed that "a thorough grounding in that science is the best possible foundation for any kind of scientific research, as a training in accurate observation and precise measurement." But when he was appointed chemist and physicist for research in oceanography at the Scottish Marine Station, founded under the powerful influence of Murray of the *Challenger*, the movement toward geography began to shape itself in his career and it received its final direction when he became Librarian of the Royal Geographical Society.

The outstanding features of his work, with the Society, as head of the British Rainfall Organization, and as a leading authority on the polar regions and particularly Antarctica, are too familiar to call for detailed comment in this notice. As for the last, there seems a sadness that he never saw Antarctica, but only his own knowledge of his poor physical condition prohibited that, for he might well have been the scientific leader of the National Antarctic Expedition, the first under Scott's command.

Modesty is an essential ingredient of good autobiography, and Mill was modest; he had also a genius for friendship. Apart from his own personality, his sketches of men with whom he came intimately into contact are among the most valuable features of the book; he had hardly ever a criticism for any of them. He found Markham, as President of the Society, dictatorial, but does not withhold admiration of him. We read of the "rich fullness of life in the Royal Geographical Society in the early nineties of the nineteenth century" and that it "was not produced without a vast amount of internal friction and toil." We are left to imagine the sources of the friction, but certainly Markham was not the only powerful personality concerned. Keltie was a moderating and inspiring influence behind more than one throne, or the aspirants to it. Mill's assessment of his own work—sometimes so detached as almost to seem as though he was writing of someone else—is exceedingly interesting. To one who read his 'The realm of Nature' as a first geographical textbook (apart from the primers of childhood) it is no matter for surprise that its author looked upon it as "the best thing I have done." Mill associated himself with Keltie, Chisholm and Mackinder (these are the colleagues whom he specifies) in the earlier labours of procuring adequate teaching of geography. At the same time his

meticulous mind strove for years to define to his own satisfaction the meaning and scope of geography. In the eleventh edition of the Encyclopaedia Britannica he had "an occasion for expressing my own views fully for the first time, and in the article 'Geography' I was able to formulate with some confidence the definition of the science." The reviewer believes this article to be the best general presentation of the subject he ever read. In this connection Mill's memory for once betrays him: Keltie was not the geographical editor of that edition of the Encyclopaedia.

Mill received a modicum of honours, but at the highest estimate, there were not more than he deserved. A Fellow of the Royal Society, when asked years ago why Mill was not of that Fellowship, answered "Well, you see, it's a matter of original work," and in so answering left the questioner where he was; it may be that Mill's setting did not direct him to the extreme heights of originality. But at least he directed himself to the highest service of those departments of geography in which he excelled, and to that of the science as a whole.

Mill did not live to be shown this book in print, but he knew that it had been accepted for publication through the instrumentality of Professor Dudley Stamp, whose brief introduction to the book will be read with gratitude by all who remember Mill and honour him. O. J. R. H.

TRAVELLER'S PRELUDE. By FREYA STARK. *London: John Murray*, 1950. 9×6 *inches;* xii+346 *pages; map and illustrations.* 18*s*

BEYOND EUPHRATES. By FREYA STARK. *London: John Murray*, 1951. 9×6 *inches;* xiii+341 *pages; map and illustrations.* 25*s*

Miss Freya Stark, in her two volumes of autobiography, is concerned less with the exploration of the physical world than with the pursuit of the enigma of personality. The result, particularly in 'Traveller's prelude,' is of great interest to the student of humanity, less so perhaps to readers who expect from Miss Stark those accounts of travel which are such an unusual blend of good writing accurate observation and arresting detail. Miss Stark's personality is however well worth pursuing, and in her second volume there is enough of general interest to balance the minutiae of private life.

Both books are based on the author's letters to and from her friends and family, strung together by a narrative of events. 'Traveller's prelude' introduces the reader to Miss Stark's background and ancestry, describing the difficult relations between her parents and touching on the domestic anxieties which resulted; recurrent ill health and a neglected education also come into the picture, but the book ends on a note of triumph with the prospect at last of a journey to the East. 'Beyond Euphrates' covers the years from 1929 to 1933, when she lived both in Iraq and Persia, worked for the *Bagdad Times* and undertook her first important expedition—fully dealt with in 'The valley of the Assassins.'

Miss Stark, in writing her own life story, travels with her mind as much as with her feet; observing, commenting, taking life's experiences hard but profitably, growing in mental and emotional stature from a difficult youth to become a woman of tempered mind who speaks today with authority on the subjects she has made her own. These two instalments of autobiography describe the forging of a personality which owes nothing to conventional upbringing or parental support; like all good travellers she does not journey without a plan, and her books are consciously designed to display those influences of heredity and environment as well as of personal individuality which shaped her destiny. She sees this destiny as that of "the wild soul" who must escape from the

domestic cage, or pine into nothingness. The Royal Geographical Society's award of the Back Grant for her travels in Luristan and the acceptance by John Murray of 'The valley of the Assassins' bring Miss Stark's story up to 1933.

D. M.

MEMOIRS OF A MOUNTAINEER. By F. SPENCER CHAPMAN. *London: Chatto and Windus*, 1951. 8×5½ *inches;* 446 *pages; maps and illustrations.* 16*s*

"For the first time *Memoirs of a Mountaineer* is available, in this new edition, to the general public." So says the dust-jacket; but there is little new about it, since the two earlier books by Mr. Chapman which form this volume had already been reissued, by arrangement with the present publishers, by the Reprint Society whose members are the general public. This appears to be a reimpression from the same plates; type and pagination seem identical throughout, except for the new title-page, one map fewer, and the addition of *burrhal* and *chorten* to a rather magpie glossary of "mountaineering" terms in which *serac* is still spelt *serrac*. The publishers' claims must therefore be counted extravagant, as is the price (16*s*) for a reprint of a "Reprint."

Production sins apart, it is right that these splendid journeys, by a traveller so aware and enterprising, should be kept alive. One day perhaps Mr. Chapman will be able to give us the definitive edition, including some much better maps.

T. A. B.

GEOGRAPHY OF LIVING THINGS. By M. S. ANDERSON. *London: English Universities Press*, 1951. 7½×5 *inches;* xiv+202 *pages; diagram and illustrations.* 8*s* 6*d*

This book is one of the volumes in the series *Teach Yourself Geography* which is edited by Professor Frank Debenham. Mrs. Anderson deals with the animate side of environment and especially with the highest of the animals, Man himself. The book thus breaks much new bio-geographical ground for the geographer who is usually well informed on matters connected with the physical background of man's environment, but too often neglects the biological factors which are frequently of great importance not only in our individual lives, but in the survival and welfare of human beings as a whole. The scope of the book is seen in the following chapter headings—"Man as an animal"; "The direct effects of his environment on Man"; "Man, rocks and water"; "General ideas on Man and his food"; "The problems of famine"; "Agricultural and dietetic patterns"; "The soil"; "Soil conservation"; "Pests and diseases."

There is no doubt whatever that this book should be read by all teachers and students of geography for it deals in clear and vivid language with matters that are essential to the proper understanding of human geography. Moreover, it is full of information that throws light upon and gives interest to many matters that are encountered again and again in lessons and lectures. Mrs. Anderson says that it is her hope that the book may help those who read it to understand something of our relations to the earth, to work with the earth and not against it, to be grateful for its gifts and to use them well. It is not the author's fault if these objectives are not achieved.

The book is illustrated by four photographs and one diagram. It is rather a pity that more illustrations are not included; also that the standard of production of those used is not very high.

L. B.

SOME RECENT TRAVEL BOOKS

Anthologies on specific subjects can be very pleasant reading, but even within their own limits a further pruning is often desirable. Mr. Van Thal

('Victoria's subjects travelled,' *Arthur Barker*, 25*s*) has confined his collection of travellers' tales to one era, Professor Jack Simmons ('Journeys in England,' *Odhams*, 15*s*) to one country; but both books are somewhat over-full. It is a pity that Mr. Van Thal loses sight of his promise to stress the intrepidity of Victorian women, and some readers may doubt Professor Simmons' being justified in introducing fictitious as well as factual accounts of journeys in England in the past. These small criticisms apart, both anthologies contain many good things, and bring home to one the luck of the old travellers who could find on their doorstep new country to traverse and to write about.

Today, when so little remarkable remains beneath the visiting moon, the traveller with a pen in his hand is sometimes hard put to it to find something new to say about the deserts and mountains, the shrines and monuments, the strange people and stranger animals he has encountered. An experienced writer like Mr. Negley Farson ('Caucasian journey,' *Evans Bros.*, 12*s* 6*d*) can however be guaranteed to produce an entertaining book, and his account of riding through the western Caucasus in 1929 is full of historical interest, human comedy and romantic beauty. Accompanied by Alexander Wicksteed, an English eccentric whose pleasure it was "to live like a Russian in Red Moscow," in the early days of enthusiasm among the intellectuals for the Bolshevik experiment, Mr. Farson enjoyed a last sight of life among the free tribesmen of the Caucasian mountains before the Communist steam roller overtook them.

Mr. Farson is an old hand at travelling; Mr. John Seymour ("The hard way to India,' *Eyre and Spottiswoode*, 16*s*) and Mr. Dunstan Thompson ("The phoenix in the desert,' *John Lehmann*, 21*s*), an English individualist and an American poet respectively, are young men who offer their readers a new approach to the much visited lands of India and the Middle East. Mr. Seymour, an easy and engaging writer, just rattles on about his experiences on the way to India and Ceylon by an unusual route through Yugoslavia, Bulgaria, Turkey, Irak and Iran; he has no axe to grind and his object is to make friends and see what are to him new and amusing things. Mr. Thompson looks inwards for novelty and presents his public with an introspective approach to the ancient places of Egypt and Lybia, Syria and Palestine; he writes in a staccato prose, somewhat lacking in verbs, which calls for a good deal of concentration on the part of the reader.

All these books are by travellers who came to admire, to study and to go home; Mrs. Olive Suratgar ('I sing in the wilderness,' *Edward Stanford*, 12*s* 6*d*) came to Persia shortly before the last war to live. She points out early in her account how very different the romance and wonder of a strange country can look according to whether you have to live in it or are merely passing through. While Mr. Farson could take the streaming rain of the Caucasus as an interesting experience, while Mr. Seymour could laugh at the Yugoslav police, and Mr. Thompson merely comment upon and leave behind the hostile crowds in Cairo, Mrs. Suratgar had from the first to accept, as part of her lot in life, the primitive living conditions and the lack of political freedom she found in Persia. Thanks to her courage and humour, and above all her devotion to her distinguished Persian husband, she learnt to do so and her book makes most pleasant reading. Many people who take an unconventional path in life seem to suffer from a resentment against those who do not, but Mrs. Suratgar has too much Yorkshire sense and independence of mind for such an attitude.

D. M.

THE SOCIETY'S NEWS

THE NORWEGIAN-BRITISH-SWEDISH EXPEDITION TO QUEEN MAUD LAND

This international Antarctic expedition, which left the country in November 1948 in the Norwegian sealer *Norsel*, returned to England in February. The Antarctic summer's operations were singularly successful and unusually fine weather made it possible for the Swedish Air Force unit, under Captain Baron von Essen, to carry out an extensive programme of air survey work. The expedition left Queen Maud Land on January 15. A full account of the expedition's explorations (which started in January 1950) will be given to the Society by the leader, Captain Giaever, in the session 1952–53. There will, too, be additional papers by other members on various aspects of the very heavy scientific programme which the expedition has carried out with such remarkable success. These preliminary reports will be published in the *Journal* pending the full publication of all the results which will undoubtedly take several years.

THE BRITISH HIMALAYAN EXPEDITION, 1952

Communiques issued to the Press earlier in the year described the discussions between the joint Himalayan Committee of the Society and the Alpine Club and representatives of the Swiss Foundation for Alpine Research about proposals for a joint British-Swiss expedition to Mount Everest this year. For practical reasons the joint venture was found to be impossible, and would in any event have been extremely difficult to mount as far as the British element was concerned in the short time available between the return of the Everest Reconnaissance Expedition in December 1951 and the departure of the Swiss expedition in March 1952. It was therefore decided that this year a British expedition should go to Cho-Oyu (26,867 feet), a mountain about 20 miles to the west of Everest, to train climbers and test equipment for a British Everest Expedition in 1953. This year's expedition will be led by Mr. Eric Shipton and will include Mr. T. Bourdillon and Mr. Hillary, members of the 1951 expedition. Meanwhile, the Swiss expedition under Dr. Wyss-Dunant and M. Rene Dittert will attempt the ascent of Everest. Both expeditions will arrive in Nepal about the same time and plans for cooperation in the approach stage (in, for example, the provision of Sherpa porters) were agreed between Mr. Shipton and the Swiss Foundation during the former's visit to Zurich in January this year. The British Himalayan Expedition's office is in the Society's House.

THE RECORD

CONTRIBUTORS TO THIS ISSUE OF THE *JOURNAL*

Count Eigil Knuth was, with Mr. Ebbe Munck, leader of the Danish expedition to Peary Land in north-west Greenland from 1947 to 1949. ***Professor Debenham***, formerly professor of geography at Cambridge and a Vice-President of the Society, has twice visited the Kalahari; on this occasion he was chairman of a mission of investigation sent out by the Colonial Development Corporation.

Dr. G. M. Lees, F.R.S., has been Chief Geologist of the Anglo-Iranian Oil Company since 1930 and is President of the Geological Society of London; *Mr. N. L. Falcon* is a Senior Geologist on the Company's staff. *Dr. W. R. Mead* is a Lecturer in geography at University College, London; in addition to several visits to Finland he has resided there for a year and is a Corresponding Member of the Finnish Geographical Society. He was awarded the Society's Gill Memorial in 1951. *Dr. J. I. Macnair* has been Chairman of the Scottish National Memorial to David Livingstone since its inception in 1929. *Miss A. M. Ferrar* has for several years been an assistant in the Society's Map Room. *E. W. Gilbert* is Reader in Human Geography in the University of Oxford. *S. Hillelson* was formerly Director of Education in the Sudan and has written a number of books and papers on that country. *Dr. F. Dixey* is Director of Colonial Geological Surveys at the Colonial Office and has previously contributed papers on geomorphology to the *Journal*.

UNIVERSITY NEWS

GEOGRAPHY IN SIERRA LEONE

A great expansion of work is now being witnessed at Fourah Bay College, Freetown, Sierra Leone. One of the largest departments in the College is the University Department within which work leading to the Pass Degree of the University of Durham is carried on, for Fourah Bay is a constituent part of that University. Geography is fast becoming a popular degree subject and is in charge of the Senior Lecturer in Geography, Dr. H. R. Jarrett, assisted by a Lecturer in Geography, Mr. I. A. W. Sparkes. The geography rooms are being replanned, and new apparatus and equipment is already in use. Research work is being carried out by the members of staff. Dr. Jarrett is carrying out investigations into the ports of West Africa which are linking up with the work of the Commission on Industrial Ports set up by the Lisbon International Geographical Congress of 1949, and is continuing his work on colonial geography with special reference to the Gambia. Mr. Sparkes is studying population problems in Sierra Leone.

Practical work forms an important part of the activities of the students reading Geography. Final Year students are now asked to submit detailed essays dealing with the geography of an area which they know well at first hand, and these essays, together with other practical work, are taken into account when final marks are being assessed; they cover a surprisingly wide field for it is interesting to note that a very large proportion of the students comes from Nigeria.

It is hoped in the future to strengthen contacts with Geography Departments at home by various means. Meanwhile the chief service rendered by the Department is that of turning out the qualified teachers of Geography who are so urgently needed in the schools of West Africa. Two former students are already teaching in Sierra Leone, and this small number will undoubtedly be greatly increased in the years immediately ahead. H. R. J.

THE INTERNATIONAL UNION OF GEODESY AND GEOPHYSICS

The International Union of Geodesy and Geophysics, which first met in Rome in 1922, held its ninth General Assembly in Brussels from 21 August to 1 September 1951. It comprises seven Associations concerned respectively with geodesy, seismology, meteorology, terrestrial magnetism and electricity, oceanography, vulcanology and hydrology. The Assembly was not as well attended by British geographers as might have been expected from the funda-

mental importance of the subjects discussed and we have therefore decided to publish notes on the work of some of the Associations and sections. The next Assembly is to be held in Rome in 1954.

Geodesy

The meetings of the Association for Geodesy were organized in five sections: triangulation, levelling, the geoid, gravity and astronomy. Of most general interest was perhaps the recent adjustment of the European first-order triangulation network by the American Army Map Service. This was done in four large blocks which together cover the whole of Europe (excluding Russia) and a part of north Africa; a total of 3469 first-order points is included and some of the blocks resulted in over 2000 condition equations. Another subject of interest was the use of "Shoran" for measuring long lines; frequent Laplace azimuth stations are necessary for adjusting the figures and an accuracy of one part in 60,000 is being obtained in Canada where the sides of the figures average about 200 miles. A Swedish invention, the "geodimeter," for measuring distances by a reflected light ray was also described and demonstrated; for distances of 20 or 30 kilometres an accuracy of about one part in 200,000 is claimed. The relative value of astronomical and gravimetric observations for determining the shape of the geoid was discussed and it was felt that both further data and further theoretical investigation were required in this field. There were also discussions on refraction and earth tides and on the geoidal complications in the adjustment of precise levelling. One paper dealt with a method for determining deviations of the vertical by chains of vertical angles between astronomically fixed points. H. A. L. S.

Seismology

Many of the seismologists had been in Brussels several days before the opening of the General Assembly in order to attend the symposia arranged by the Committee on the Physics of the Earth's Interior. This joint committee of the Associations of Geodesy, Seismology, Terrestrial Magnetism, Oceanography, Vulcanology and Hydrology had arranged symposia on "Thermal problems," "Continents and oceans," "The core of the earth" and (during the Assembly) on "Movements of the earth's crust." At a meeting of the Executive Committee of the Union it had been suggested that topics relating to the physics of the Earth's interior might be brought within the ambit of one, or more, of the Associations and, after a full discussion, the Association of Seismology undertook to cater for the new subjects, many of which are geothermal. The offer was accepted by the General Assembly and the Association now becomes "The International Association of Seismology and the Physics of the Earth's Interior."

Dr. R. Stoneley's Presidential Address to the Association was on "The international seismological summary: an example of international co-operation in science." The summary originated in the work of John Milne and was sponsored for many years by the Seismological Investigations Committee of the British Association. It is now the responsibility of the Association of Seismology and, particularly in post-war years, finance has been a source of great anxiety. It is scarcely possible to summarize the whole range of subjects discussed at the sessions; communications were grouped under the headings—theoretical seismology, seismographs, earthquake magnitudes, seismicity, and the applications of explosion technique to the determination of sub-surface structure. In addition two joint meetings were held, one with the Association of Physical Oceanography on the exploration of the ocean bed and one with the Associations of Meteorology and Physical Oceanography on microseisms.

The new President of the Association is Professor B. Gutenberg; Professors H. Jeffreys and P. Caloi were elected Vice-Presidents. A Commission was set up for the study of European seismological problems which should greatly facilitate cooperation between European seismologists who, because of the existence of a large number of national committees, feel a need for more frequent interchange of ideas than is afforded by triennial General Assemblies.

The Association's programme included a visit to the seismological station at Uccle and an excursion to the valley of the Haine, where a seismological and geological study of Hainault was followed by a visit to a coal-mine. R. S.

Meteorology

The full programme of the Association of Meteorology reflected the wide field with which this body is concerned. In his Presidential Address, J. Bjerknes outlined the advances in our knowledge of the general circulation of the atmosphere since Dr. H. Jeffreys presented a paper on that subject at the Lisbon meeting in 1933. The regular upper air observations of recent years have been of great importance in this direction, though much remains to be done. He described work by himself and his associates in California on the transfer of angular momentum across latitude circles, at levels up to the stratosphere, in relation to the maintenance of the westerly circulations.

Notable features of the programme were the pre-arranged symposia during which contributions, grouped according to main fields of research, were presented and discussed. The titles of the symposia and the names of the chairmen must suffice as a general indication of the subject matter—cloud physics (Professor T. Bergeron), radiation (Dr. A. Ångström), micrometeorology (Professor O. G. Sutton), atmospheric ozone (Professor G. M. B. Dobson), general circulation of the atmosphere and oceans (jointly with the Association of Physical Oceanography, Professors C. G. Rossby and H. U. Sverdrup), and physics of the high atmosphere (jointly with the Association of Terrestrial Magnetism and Electricity, Professor J. Kaplan). At each of these symposia the papers were numerous and gratifyingly international as to place of origin. Viewed together, they represented in considerable detail the wide sweep of work in progress on dynamical and physical processes within the atmosphere from its base to great heights, and of the impact of modern observational and theoretical developments. Joint meetings on evaporation at the earth's surface and on microseisms were held with the Associations of Hydrology and Oceanography respectively. The Association of Hydrology itself, largely attended by engineers, discussed precipitation and evaporation from a rather different angle from that of the meteorologists. They discussed, among other matters, the need for standardized measurement of the hydrological characteristics of the major rivers and for reconnaissance surveys of soil erosion.

In parallel with other discussions in progress, a day was devoted to climatological topics. In addition, the Commission on Ozone reported that the network of stations (as planned by the Association) for ozone measurements in western Europe is almost complete; while the Commission on Radiation reported on work at Davos and Uccle on the perfection of radiation measurements. The Association also considered proposals, which would involve other international organizations, relating to a third International Polar Year in 1957–58 and the institution of "world-days" for upper atmospheric research, and discussed upper atmospheric terminology. A visit to the Royal Belgian Meteorological Institute at Uccle Observatory was highly enjoyable in all respects. H. W. L. A.

Oceanography

The Association of Physical Oceanography met under the presidency of Professor H. U. Sverdrup ably assisted by the secretary, Professor H. Mosby. Among the papers of general interest was that of Professor Hans Pettersson who outlined the wide field of research now being conducted in many countries on material brought back by the Swedish deep-sea expedition of 1947–48. Many interesting deep-sea organisms had been procured, some of them new to science; a large number of water-samples at various depths had been obtained, the chemical constitution of which was likely to reveal much concerning water movements at depth and the origin of water masses. His deep-sea cores had already yielded results which will prove of considerable importance in many branches of science. Dr. R. S. Dietz spoke briefly of the results now being obtained from the Scripps-Navy mid-Pacific expedition of 1950. Photographs had been obtained of the deep-sea floor at great depths, clearly showing ripple marks in globigerina ooze which indicated relatively strong bottom currents. Middle Cretaceous shallow water corals and other fossils, identified by Dr. E. L. Hamilton, had been discovered on the 1000-fathom tops of guyots (sea mounts with flat tops). Papers were also read on tidal movement, waves and surges. Of these particularly interesting were the experiments carried out by the Liverpool Observatory and Tidal Institute, on the surges in the Irish Sea and North Sea due to piling up by wind with the passage of depressions.

Dr. J. D. H. Wiseman presented the current results of his study of a deep-sea core from the equatorial Atlantic, collected by the Swedish deep-sea expedition; the CO_3 content of core samples was a direct reflection of the productivity of the carbonate-secreting surface-living foraminifera and Mr. C. D. Ovey demonstrated that the distribution of these organisms was a direct function of sea-surface temperature. A high productivity, that is a high CO_3 content, was found to be representative of a warm period and in this way climatic variation in the cored sediment could be traced. Dr. P. B. Phleger confirmed the high sensitivity of planktonic foraminifera to temperature changes and discoursed upon the value of benthonic foraminifera now being investigated in cores taken on the continental slope of the western Atlantic. From his results there were indications of considerable vertical movement in the Pleistocene in this area.

The Committee on the Nomenclature of Ocean Bottom Features considered the revision of definitions for features of the deep-sea floor. Of interest, too, was a meeting of an *ad hoc* committee to discuss the microstructure of the deep-sea floor; recommendations were sent by this committee to the newly formed Joint Commission on Oceanography, dealing with the disposal, storage and publication of echo-sounding records and with future work in echo-sounding technique which is likely to produce results of prime importance to the study of deep-sea morphology. C. D. O.

Glaciology

The glaciological work of the International Association of Hydrology is dealt with by its Commission on Snow and Ice. The Chairman of the Commission, H.E. Dr. H. W:son Ahlmann, was unable to attend and Mr. J. M. Wordie, the Vice-President, presided. The time-table was well arranged by the Honorary Secretary, Mr. P. D. Baird, so that ample time was left for the discussion of the twenty-five papers presented, including eight in a symposium held at the request of U.N.E.S.C.O. on the distribution of snow and ice throughout the world. In addition six papers were read by title or presented

in summary. All these, together with one or two received too late for inclusion in the business of the Commission, will be published in the *Proceedings* of the Association. A list of the titles is published in the *Journal of Glaciology* (2 (1952) 62).

In addition to the papers and discussions, considerable time was given to consideration of the report on a proposed International Classification of Snow, which in effect is a scheme for recording the nature of the snow cover, its hardness, density, moisture content and many other features. This classification has developed naturally from the need for standardizing and systematizing the very large number of observations that are now being made over the immense areas of snow-covered territory in both hemispheres. It will be of value both in its scientific and practical aspects, which include winter transport and the forecasting of "run-off" for agriculture and the prevention of spring floods. The need for a standardized classification became apparent at the Oslo meetings of the Commission in 1948 when several divergent systems of classification were proposed. The Commission accordingly set up a Committee consisting of Messrs. V. J. Schaefer (United States), G. J. Klein (Canada) and M. de Quervain (Switzerland) to coordinate them. A provisional classification was produced in America by this Committee and was scrutinized by Professor U. Nakaya, a leading Japanese glaciologist, and the results were in turn reviewed at a meeting of the British Glaciological Society in London. The task has been of inordinate complexity and it is believed that something useful and important has been accomplished.

Representatives from many countries were present at the Commission's meetings, those from the Scandinavian countries, Switzerland and Great Britain providing the greater part of the attendance. Glaciologists from Germany, Austria, Iceland and France were misssed, since the glaciological contributions of the two first-named have been so great in years past, while in the last two countries glaciological associations have recently been formed.

The new officers of the Commission for the triennium to 1954 are: President: Mr. G. Seligman (Great Britain), Vice-President: Professor R. Haefeli (Switzerland), Honorary Secretary: Mr. P. D. Baird (Canada). G. S.

INSTITUTE OF BRITISH GEOGRAPHERS

The Annual Conference of the Institute, from 3 to 7 January 1952, was notable for being held for the first time outside metropolitan England. The physical isolation of West Wales did not prevent over 120 members from gathering at Aberystwyth from all universities in the British Isles; members and associates from the Dominions and Colonies and from Germany and France also attended. With such a good attendance, and the excellent provision made by the University College of Wales, the meeting proved highly successful.

The programme included as usual a variety of papers and excursions and was especially valuable for the many opportunities it gave members for informal discussion. Professor A. G. Ogilvie delivered his presidential address on "The time element in geography," and Professor S. W. Wooldridge opened a discussion on "The applicability of geography." Papers on geomorphological topics were read by Miss A. Coleman and Mr. E. H. Brown; Dr. W. R. Mead presented a map of ridge and furrow in Buckinghamshire and Professor A. Davies developed an interesting thesis concerning the loss of the *Santa Maria*. Miss June Sheppard, Mr. F. A. Barnes, Mr. H. B. Rodgers and Mr. L. E. Tavener contributed papers to a session devoted to various aspects of agricultural geography and, in a paper of great topical interest, Mr. A. Mountjoy made a discerning examination of Egypt's population problem.

An introductory lecture by Professor Emrys G. Bowen emphasized the individuality of the local setting and served admirably as a background for the well-planned excursions, on which members of the staff of the local Department of Geography developed and illustrated points in detail. These excursions studied the site and morphology of Aberystwyth, the coastal features near Borth, the river development and land forms of the Rheidol and Ystwyth valleys and the glacial features of the Cader Idris district. Members were also invited to a special exhibition of maps at the National Library of Wales.

At the Annual General Meeting, Mr. B. H. Farmer of St. John's College, Cambridge, was elected as Assistant Secretary in place of Mr. R. W. Steel who now becomes Editor in name as he has for some time been in fact. Mr. M. R. G. Conzen, Mr. J. N. Jennings and Dr. D. K. Smee were elected Ordinary Members of Council, replacing Professor R. O. Buchanan, Dr. P. R. Crowe and Professor R. F. Peel.

The next Annual Conference will be in London from 2 to 5 January 1953 and will again be a residential meeting, accommodated in Bedford College.

A. E. S.

A JUGOSLAV GEOGRAPHICAL CONGRESS

The second Congress of Jugoslav geographers was held in Macedonia from 21 to 30 September 1951. About 250 Jugoslav geographers representing universities, schools and state institutions, together with guests from France, the United States and Britain, took part in the proceedings. The Congress opened in Skopje where the ceremony of sending a telegram to Marshal Tito was duly observed.

On the first day introductory papers on Macedonia were read. A. Urošević dealt with "The geographical features and importance of Macedonia" in which he reviewed some of the changes in the economic structure of the republic in recent years. B. Ž. Milojević concerned himself with a general division of Macedonia into its major natural regions, and a lively but inconclusive discussion ensued on the limits of Mediterranean and continental influences in this area. The second day was spent sightseeing in Skopje which offered many attractions, including the Venetian and Ragusan bazaar of the Kuršumli Han which is still in fine repair. The gipsy quarter gave the impression of being as it was a hundred years ago but the town itself has changed since the day when Miss G. M. Mackenzie described it as a "decaying and wretched place, its inhabitants sickening under the unhealthy exhalations of undrained marshes." An excursion was made to view the hydro-electric station in the Treska gorge and the site of the ancient Roman town of Skopia a few miles to the west of the present town.

On the following day delegates were taken by bus on a tour of western Macedonia. The route lay through the tobacco towns of Titov Veles and Prilep. The upper part of Prilep basin is now almost entirely devoted to tobacco, to the exclusion of practically all other crops, though whether this is a wise policy is doubtful. After a short stay in Bitola on the old Egnetian Way the night was spent at Oteševo, a new "trades union" resort on the western shore of Lake Prespa, close to the Albanian frontier. A move was made to Ohrid early the following morning where the main business of the meeting was conducted. All members of the teaching profession in Jugoslavia must belong to a trades union, and membership carries with it the privilege of being allowed to stay in tourist centres like the impressive Sindikale Dom in which the delegates were housed. Your correspondent was not sure of his status in this matter but was assured that formalities would be waived in his case.

The main business included the reading of four papers on Macedonian geography, and papers of a more general nature followed the next day. J. Roglić's paper on "Problems of abrasion relief" provoked a great deal of discussion since he set aside Cvijić's ideas about the formation of Neogene terraces by marine action, in favour of the more likely explanation that their formation was due to ordinary fluvial erosion following a period of rejuvenation during and after the Ice Age. S. Ilešič read a paper on "Economic geography" in which he dealt with a problem peculiar to Jugoslav universities. Partly due to Russian influence, economic geography is taught as a branch of economics, and Ilešič saw no good in this practice which he regarded as a threat to the unity of the subject.

On the final day at Ohrid a trip was made by boat on the lake to the medieval monastery of Sve. Naum barely a few hundred yards from the Albanian frontier. In the afternoon, papers on French, American and British geography were read by the guests of the Congress, A. Blanc, Chauncy D. Harris and H. R. Wilkinson. An exhibition of British and American geographical literature and maps aroused great interest. There was also a display of wall maps and relief models prepared by the Cartographic Institute at Zagreb.

The Congress ended with a two-day return tour from Ohrid to Skopje. Among places visited were Struga, the gorge of the Crni-Drim, and the site of the Mavrovo hydro-electric plant. Here an ancient lake basin is to be used as a reservoir to store water diverted from nearby streams. The earth banks which are to retain the dam are already near completion, thanks to the use of British and American machinery. From the lake a tunnel is to be bored to the Tetovo basin, giving a total drop of some 500 metres. Lazaropolje, a mountain village once famous for its medieval painters and woodcarvers, was also visited.

As on the occasion of the last Congress, local hospitality knew no bounds; guests were regaled with bountiful supplies of *jogurt*, *paprika* and *talumba*. They came to know the music of the *gajde* and the *zurla*, the steps of the *kolo*, and the virtues of *slivovica*. H. R. W.

LAND USE IN NORTHERN IRELAND

All the eleven sheets of the Northern Ireland Land Utilization Survey have now appeared. As explained in a previous note in the *Journal* (110 (1947) 250–251) the maps differ from those of Britain in only one respect—bogs are shown as unproductive and are coloured red; sheets 1, 4 and 9 which include the Bann valley and sheet 8, covering the lower Erne valley, have large patches of red which extend over both the lowland bogs and the reed fens beside the numerous lakes. Bogs on mountains are shown as rough pasture, in yellow. It has not been possible to distinguish between permanent pasture and meadow, and it is only for a short period of the year that the difference is clear in the actual fields. The official statistics divide the hay crop into three categories, first year hay, second and third year hay, and permanent meadow. The survey work was done in 1937–39 and the picture given is not that of the present day; during the war the area under crops increased by 80 per cent. to a maximum in 1943 and then declined, though in 1949 the cropped area was still 40 per cent. more than in 1939. The hay acreage, on the other hand, declined by 6 per cent. in the same period. Improved grassland however still covers 36 per cent. of the total area, as compared with 19 per cent. crops and 12 per cent. hay, and 21 per cent. of "grazed mountain," which term is used in the Irish sense and includes rough pastures at any altitude. During the war period there was in the province a vast increase in agricultural output which was not shared by the Irish republic: naturally, this is not shown on the maps but may well be discussed in the forthcoming memoirs and reports.

Certain features of the agriculture of Northern Ireland are shown very clearly on this series of maps. The predominance of green for pasture, meadow and cropped hay strikes the eye at once and the varying upper limit of cultivation, generally a sinuous line somewhere between 600 and 1200 feet, is also of interest. The brown areas of arable land are small and separated from one another; even if allowance were made for the 40 per cent. increase in cropping the effect would be similar, for there is no continuous belt of cropped land. One feature that emerges is the smallness of the farms, 63 per cent. of which were, in 1949, of less than 30 acres. The houses dotted through the rural landscape, the infrequent villages and the long distances between market towns are all shown by this method of mapping. Compared with the physically similar landscape of south-west Scotland, Northern Ireland is a country of small farms and small fields; it is a landscape of almost microscopic diversity, having on the normal farm a few green fields, an acre or so of potatoes, and a precious crop of "corn"—which almost invariably means oats, for in 1949 the area given to wheat in the whole province was under 2000 acres (less than in 1939) and to barley, under 6000 acres. Slowly but steadily, the area used for fruit growing has expanded from 8000 acres in 1939 to nearly 11,000 acres in 1949 and the specialization in fruits in the area to the south of lough Neagh (on sheets 6 and 9 small areas appear in the purple symbol) is firmer than ever. Now, as for more than a century, flax is widely grown at some times and not at others according to price movements. It was grown on 125,542 acres in 1944, but on only 17,449 acres in 1947.

The maps show something that is abiding—the dominance of meadow and pasture in the landscape, the limitations imposed on farming by mountains and peatbogs, the high density of rural population, the sparsity of woodland and the small area covered by towns, even in the Lagan valley, outside Belfast. The essential point is that the vast majority of the farms have a mixed economy: the produce may include cattle, sheep, pigs, poultry, potatoes, grass seed, flax, oats and, in a few cases, fruit; and the farmers can adjust their production to changing economic circumstances and government policies.[1]

The intention is to publish memoirs on a sheet basis, but a final report on the whole of Northern Ireland is also promised and the memoirs will presumably preserve for posterity much interesting local information; Northern Ireland has in fact become an agricultural area economically quite different from the Republic. Praise must be given to the Geographical Association of Northern Ireland, whose members did much of the fieldwork, and especially to Mr. D. A. Hill who has organized the survey from its beginnings in 1937. T. W. F.

STONE POLYGONS AND RELATED PHENOMENA

A. L. Washburn, Director of the Washington Office of the Arctic Institute of North America, has performed a service in summarizing succinctly, in a paper in the *Revue Canadienne de Géographie*,[2] the most satisfactory theories of the formation of stone polygons and related phenomena. He indicates his own preferences among them and includes a valuable series of photographs and a bibliography. A sensible attempt is made to simplify the terminology, the terms selected combining some of the best points of a descriptive and a genetic classification. It is perhaps a little arbitrary to draw a distinction between circles and polygons and, as the group of polygons and stripes termed "non-

[1] For recent statistics, see 'Ulster Year Book 1950,' Belfast, pp. 63–74.

[2] A. L. Washburn, "Patterned ground," *Revue Canadienne de Géographie*, Montréal, 4 Nos. 3–4 (1950) 5–59.

sorted" are distinctive in that they require vegetation, it might have been well to refer to this important characteristic in the terminology; but these are minor points.

The importance of alternate drying and soaking even in Polar regions is rightly stressed, and it is considered to give rise to a greater contraction and expansion than does freeze-and-thaw. Attention is also drawn to the frequently rapid transition from fine to coarse material in the soil section as it approaches the surface; but this is not necessarily the result of weathering in the uppermost layer. The author appears to ignore the dual effect of wind removal of fine material and the downward sinking of dust and finer particles; provided the deposit is a fairly old one, the lower layers of even what was originally a pure pebble deposit, such as occurs at Dungeness, include a matrix of dust.

The author supports the "cryostatic hypothesis," an important element of which is the assumption that large hydrostatic pressures are set up in the zone confined between the downward freezing of the upper layer and the rock (or permanently frozen subsoil) below. But, surely, such pressures can only arise if the upper and lower layers are locked together in some way, either by large boulders or by interconnecting frozen masses. Admittedly the enclosed lenses of unfrozen material will be under pressure but, whether it is frozen or not, the upper layer can exert no greater pressure than its own weight if it is separated from the permanently frozen layer below.

Perhaps the author's facility for setting out complicated theories so briefly has misled the reviewer on some of these points; most of the hypotheses are admirably summarized, and searchingly but constructively criticized.

W. V. L

THE FIRST ASCENT OF TIRICH MIR

We have received from Professor Kaare Strøm of the University of Oslo a short account, prepared by the geologist Finn Jørstad who accompanied the expedition, of the first ascent of Tirich Mir in June 1950. A fuller account will be found in the *Himalayan Journal*.[1] The expedition, under the leadership of Professor Arne Naess, was jointly organized by the Norwegian Alpine Club and the Norwegian Geographical Society, with considerable financial support from the newspaper *Aftenposten*. It comprised nine members from Norway, including the geologist and a botanist and two photographers, and was later joined by Captain H. R. A. Streather of the Chitral Scouts and an Indian botanist, while the president of the Lahore Alpine Club accompanied it as liaison officer.

Tirich Mir (25,263 feet) is the highest summit of the Hindu Kush range which forms the watershed between the Indus and the Amu Darya and dominates the State of Chitral. Professor Naess had made a reconnaissance of the mountain in 1949, and in 1950 an advanced base was established at Shokor Shal, a grazing ground above the foot of the North Barum glacier, on June 11. The summit was reached on June 21 and 22. Finn Jørstad, working from the advanced base, made a study of the glacier and its moraines, and geological and botanical collections were brought back to Norway. Certain corrections and additions to the Survey of India map were made by compass and clinometer.

The account, which is illustrated by a number of good photographs, includes notes on transport and a useful bibliography of the scattered literature relating to Chitral. It has been placed in the Society's Library and the accompanying map and photographs are in the Map Room.

[1] H. R. A. Streather, "Norwegian expedition to Tirich Mir, 1950," *Himalayan J.* 16 (1950–51) 59–73.

THE ERUPTION OF GOENOENG KOMBANG

Kelut (Goenoeng Kombang), a volcano in the Kediri district of eastern Java, erupted suddenly in the early morning of 31 August 1951 and is reported to have caused a good deal of material damage. Stones the size of a fist fell 15 kilometres from the crater and the street lights of Djogja, 220 kilometres away, had to be lit at 11 o'clock because of the rain of ash; rain drizzle caused by the eruption fell as far off as Bandung, 500 kilometres away. The town of Blitar, at the foot of the mountain on the south-west, suffered an earthquake shortly before the eruption and later a rain of ashes and gravel covered the streets to a depth of from 2½ to 10 centimetres. The population began to leave the town which lay in the likely path of any lava flow; the prisoners in the jail panicked and all but eight of the 348 fought their way out. No lava came. Other towns and villages to the west of the mountain also experienced the rain of ash, and crops were damaged. No fatalities were at first reported but one later estimate put the number of deaths at 400. At the last eruption, in 1919, over 1000 people were killed.

THE *GEOGRAPHICAL BULLETIN* OF CANADA

The Geographical Branch of the Department of Mines and Technical Surveys is charged with the collection and organization of the materials for a geographical description of Canada. It undertakes both field work and compilation and one of its main projects is a national atlas of the Dominion. Memoirs on particular subjects will be published from time to time, and the new *Geographical Bulletin* is to be published twice a year. We have received copies of the first issue (1951) from the Director, Dr. Wreford Watson, and its contents illustrate the scope of the investigations carried on in the Branch. There is a paper on the establishment of settlement patterns in a small region of Ontario, one on the physiography of a region in Keewatin and another, in French, on the port of Trois Rivières and its hinterland in Quebec; of more general interest is D. F. Putnam's summary of the "Pedogeography of Canada."

In the earlier phases of colonization little attempt was made to investigate agricultural possibilities in advance, but between 1857 and 1860 the British Colonial Office, on the pressing recommendation of the Royal Geographical Society, employed Captain John Palliser to examine the lands of the interior with a view to their settlement; he received the Society's Gold Medal in 1859. Dr. Putnam begins his paper with a review of progress in soil surveys since then, and proceeds to describe the major soil-zones of Canada, illustrating each with diagrams of the soil-profile, of temperature and precipitation, and of Thornthwaite's concept of "evapotranspiration." First come the "brown soils" of southern Saskatchewan and Alberta, recognized by Palliser as too dry for agriculture and later to become the Dust Bowl of western Canada. Successive zones of dark brown and black soils surround this centre of aridity and comprise the best wheat lands of the Dominion; the difference is climatic and due rather to lower effective temperatures than to a higher rainfall. Northwards and eastwards, up to the tundra, lie relatively poorer forest soils, but here the characteristic profiles reflect other than climatic factors and the good land is in scattered patches. The mountain soils of British Columbia are still more differentiated by topography and the valley sides tend to recapitulate all the zonal types, from the alpine tundra and the leached *podsols* of the forested upper slopes to the brown soils of the rain-shadowed bottoms. This interesting paper concludes with a summary of land classification in Canada; where so much of the land is incompletely developed the emphasis is on "capability ratings."

The *Bulletin* also contains notices of new books and maps. It may be obtained

from the Geographical Branch, Department of Mines and Technical Surveys, Elgin Building, Ottawa and the price is 50 cents a copy, or $1 per year post free.

ATLAS VON NIEDERÖSTERREICH

An atlas of the province of Lower Austria, of the type we are accustomed to call National Atlases, is now being published under the editorship of Dr. Hugo Hassinger and Dr. Anton Becker in five or six parts, of which the first has recently appeared (Vienna, Freytag-Berndt, 1951). It is planned to contain, when complete, about 200 maps showing mainly physical, economic and deomographic distributions.

The first part contains a morphological and an administrative map, followed by a somewhat involved map of natural regions, all on a scale of 1 : 500,000. Eight phenological maps are on half this scale, but it is used again to show land use, and the distribution of seven of the major crops—rye, wheat, oats, barley, potatoes, beet and fodder crops. Each administrative district is coloured according to the percentage of agricultural land under the particular crop. The statistics used are for 1939, but the local boundaries are those for 1950. There are also smaller maps distinguishing between summer and winter wheat, barley and rye, and showing maize and oats. The location of various types of industry is shown by symbols on a 1 : 500,000 map of the whole province, and also on a larger scale for several of the more important areas. The last map shows territorial development from the tenth to the thirteenth centuries.

It is expected that sheets for topography, geology, climate, population, etc., will be issued later. The maps are colour printed and have a generally pleasing appearance. It is a little surprising that they should not be numbered, particularly as they will presumably remain loose in paper folders until the atlas is completed in 1953. A. M. F.

BERGE DER WELT

The sixth volume in the series 'Berge der Welt,' 1951, published by the Swiss Foundation for Alpine Research and edited by Marcel Kurz, contains accounts of three expeditions to the Himalaya, recording ascents of Abi Gamin, Annapurna, and Tirich Mir by Swiss-British, French and Norwegian parties in 1950. These deal almost exclusively with the mountaineering aspect, and the editor laments the absence of geographical observations. This is no doubt a shortcoming which the Foundation will in time be able to remedy. The other major work described is that of the Swiss participants in the Baffin Island expedition of 1950, organized by the Arctic Institute of North America, and led by P. D. Baird. Here in addition to the narrative of travel and ascents, there are short summaries of geological and other scientific observations. The volume concludes with a chronicle of mountaineering in many parts of the world and a critical comparison of the newly compiled map of Sikkim by Marcel Kurz (1 : 150,000) with Survey of India sheets. It is lavishly illustrated with striking photographs of mountain scenery, and there are three maps and a panorama in a pocket.

GEOGRAPHISCHES TASCHENBUCH, 1951–1952

This issue of the "Geographisches Taschenbuch," produced by the Amt für Landeskunde under the editorship of Dr. E. Meynen, has been considerably expanded. The sections on geographical institutions, university departments of geography, etc., include some other European countries besides Germany, and there are bibliographies of various aspects of German geography and planning.

The short articles, more numerous than formerly, deal with a variety of subjects, *e.g.* the soils, forests, agriculture and power resources of Germany, and more general themes such as practical aids to geographical research, soil surveys in the field, relief on maps, and the construction of cartograms. The volume thus forms a useful reference work for those engaged in geographical research and planning. A guide to its somewhat heterogeneous contents is provided by an index, which covers also the two earlier issues.

A NEW FRENCH GEOGRAPHICAL SERIES

The second volume of the *Mémoires et documents* published by the Centre de Documentation Cartographique et Géographique, Paris, contains a long monograph by J. Tricart on fruit growing in the Paris region, and a number of shorter studies based on theses presented for the "Diplôme d'études supérieures de géographie" of the University of Paris, all of which deal with aspects of rural life and agricultural geography in the Paris basin. M. Tricart illustrates in detail how all the factors, physical, economic and social, interact to produce a diversity of cultures, holdings and systems of exploitation. The shorter studies emphasize the great variety of the French *pays*, and of their evolution in recent centuries. The basis of this research is largely statistical and cartographic, and many maps and diagrams are reproduced. The volume concludes with classified bibliographies of recent books, maps and photographs relating to Belgium and the Netherlands. The series is a valuable addition to those devoted to the publication of original geographical research. It may be obtained through Messrs. H. K. Lewis.

THE MAP DIVISION, LIBRARY OF CONGRESS

Several publications of interest to geographers have recently been received from the Reference Department of the Library of Congress. The Department includes the Map Division (Director, Burton W. Adkinson), the organization, function and activities of which are succinctly described in a manual. Like many national map collections, the Division has expanded very considerably since 1939; the steps taken to deal with these acquisitions and to secure adequate coverage are described. While all accessions by copyright and certain special classes are catalogued, only a fraction of the total collection has been dealt with. It is noted that a supplement of P. L. Phillips' well-known 'List of geographical atlases' (4 vols. 1909–20) is being prepared for publication, news which will be welcomed by students of historical cartography. The Department has published a bibliography by W. W. Ristow (Assistant Chief) on 'Three dimensional maps,' with annotations which indicate the various methods used for preparing relief maps. Embossed plastic models appear to be most favoured, and relief maps of this type on the scale 1 : 250,000 were made for Korea. It is interesting to note that the first reference to a relief model was made by John Evelyn in 1665. No mention is made of the French use of photographs from models for preparing hill-shading plates for topographic maps. Another publication is a selected and annotated bibliography of the Arabian peninsula. This includes works in English dealing principally with present-day conditions. All articles in periodicals after 1930 are separately listed, many from this *Journal*. A comprehensive list of this character is of considerable value today. These mimeographed publications may be obtained at prices ranging from 30 to 80 cents.

THE JOHN MURRAY TRAVELLING STUDENTSHIP IN OCEANOGRAPHY AND LIMNOLOGY

This Studentship is open to male British post-graduates under the age of thirty-five. Its value will be between £500 and £700 and it may be awarded

for a period of one year or less. Though the Studentship is not restricted to oceanographical work, it is hoped that it will provide an opportunity for deep-sea oceanography and that the student will be able to sail in research ships and visit research stations abroad. Application should be made before 31 March 1952 on a form which may be obtained from the Assistant Secretary of the Royal Society, Burlington House, W.1.

THE McGILL—ARCTIC INSTITUTE CARNEGIE FELLOWSHIP

An annual Fellowship of the value of $4000 is offered for arctic or sub-arctic research and is tenable at McGill University. It is primarily intended for senior men or women who have completed their academic training and wish to continue a special line of research, or complete a monograph, where reference works and other facilities are available. Application should be made before 1 May 1952 to the secretary of the Carnegie Arctic Program, Arctic Institute of North America, 2485 University Street, Montreal, and candidates may submit confidential recommendations as to their qualifications.

THE INTERNATIONAL CONGRESS OF AMERICANISTS

The thirtieth Session of the International Congress of Americanists will be held in Cambridge from 18 to 23 August 1952, the main subjects for consideration being exploration and settlement, colonial history, archaeology, ethnology, social and physical anthropology, language, human geography, folklore and contemporary social studies. Further details may be obtained from the Organizing Committee, University Museum of Archaeology and Ethnology, Downing Street, Cambridge.

A FRENCH COURSE IN PHOTOGRAMMETRY

A course in photogrammetry intended primarily for foreign students is to be held at the École Nationale des Sciences Géographiques in Paris from 23 June to 1 August 1952. Instruction will be mostly in French and the course, which includes both theoretical and practical work, is designed to familiarize the student with French methods and apparatus; it is assumed that he is already familiar with the principles of air survey. The programme includes visits to an air field, to drawing offices and to survey parties in the field. The fee for the course is 20,000 francs and members will be required to meet their own living expenses; the number to be admitted is limited to twenty-five. Application should be made before 15 May 1952 to the Director, École Nationale des Sciences Géographiques, 35 Boulevard des Invalides, Paris VI^{e}.

STUDIES IN REGIONAL PLANNING

We are informed by Messrs. George Philip that, in response to frequent inquiries, they have now arranged to publish separately the studies in regional planning which were reviewed in the *Journal* in December 1949 (114 (1949) 102–3).

OBITUARY

REAR-ADMIRAL RITTER LUDWIG VON HÖHNEL

Since the end of the war several attempts have been made to trace the whereabouts of Admiral von Höhnel, but it was only recently discovered that he died in Austria in 1942 at the age of eight-five. Höhnel was the last surviving explorer to have made a major geographical discovery in Africa. In 1888, together with Count Samuel Teleki von Szék he discovered lakes Rudolf and Stefanie; on 23 January 1887 they set out from Zanzibar with a retinue numbering 659, and first saw lake Rudolf on 5 March 1888. After marching around the 200 miles circuit of the lake, and also visiting lake Stefanie, they finally returned to the coast on 24 October 1888 with a sadly depleted party.

Born in 1857, von Höhnel was the youngest son of a civil servant. From 1864 to 1868 his family were stationed at Trieste and it was then that he first formed an ambition to join the navy. In 1876 he passed out of the Naval Academy at Fiume. He was also keenly interested in natural history and geographical exploration in Africa, but it was not till 1886 that he was presented with an opportunity of travelling to Africa himself. In that year he happened to be on board the Royal yacht when Count Teleki was discussing with the Crown Prince Rudolf and his consort Princess Stefanie a projected hunting expedition to Africa. In fact it was only upon the insistence of Crown Prince Rudolf that Teleki accepted Höhnel as his companion. The original plan had been for a purely hunting expedition to Lake Tanganyika, but after considerable discussion Höhnel persuaded Teleki to take the expedition into the unknown territory south of Abyssinia where native reports suggested the existence of two large lakes. It was thus entirely due to Höhnel that a purely hunting expedition was turned to scientific account.

Not only were lakes Rudolf and Stefanie discovered, but Höhnel brought back an excellent topographical map of the surrounding country. In addition his industry resulted in the collection of large numbers of geological, zoological and botanical specimens, together with a mass of detailed information. It was these notes and specimens which made possible the publication of numerous scientific papers in addition to his general account of the expedition ('Discovery of Lakes Rudolf and Stefanie' by Ludwig von Höhnel, London, 1894).

Three years after his return from Africa he was invited by William Astor Chanler to take part in a scientific expedition to the Tana river. During the years 1892–94 this expedition explored the region east of Mount Kenya but was brought to a sudden end when von Höhnel was injured by a charging rhinoceros and had to be carried back to the coast.

From then on he continued his naval career until May 1899 when he became *aide-de-camp* to Emperor Franz Josef.

In 1905, when in command of the torpedo cruiser *Panther*, he was despatched to Australia and the Far East. In the course of this voyage he was ordered to stop at Djibouti and to proceed to Addis Ababa in order to conclude a commercial treaty with Emperor Menelik. He proceeded inland with a caravan of 240 mules, a large native retinue and an escort of sailors from the *Panther*. Emperor Menelik gave him a warm welcome and discussed with interest his discovery of Lake Rudolf. Continuing the voyage to Australia and New Zealand, his time was largely occupied by the usual succession of ceremonies and entertainments; but he still found time for natural history. It is interesting to

note that it was Höhnel who introduced chamois from the Emperor's hunting grounds at Muerztag to the mountains of New Zealand.

His next commission was the armoured cruiser *St. George*, in which he was despatched to New York. Eighteen months later he was appointed Commander of the Sea Arsenal at Pola, and in May 1909 he retired from the service. Until his death he continued to take the keenest interest in Africa exploration and, when visited in Vienna in 1935, he spoke fluent English and had still a command of Kiswahili. His hobby was to follow the movements and exercises of the Royal Navy for which he had an unbounded admiration.

With the death of Admiral Ritter Ludwig von Höhnel a link with the past was broken, for there were few who could still claim to have travelled in the Africa of Livingstone and Stanley, at a time when the white man was still unknown to a majority of the native peoples. V. E. F.

CORRESPONDENCE

VOYAGING DISTANCE AND VOYAGING TIME IN PACIFIC MIGRATION

I wish to lodge a protest against the manner in which Heyerdahl, in his last article in this *Journal*, has misquoted and misinterpreted my words.[1]

Referring to me, he says: "It is to go too far to deduce, as he does, that our westward drift from Peru to Polynesia on a balsa raft establishes that a canoe must accordingly be able to travel eastward from Polynesia to Peru with the same ease, and thence return to Polynesia again." I never said such a thing. Of course, Heyerdahl's westward voyage does not prove that the Polynesians were able to sail eastward, from Polynesia to America. It does however prove that, if Polynesians reached the coast of South America, return voyages were perfectly feasible, and that is what I said.[2] It is so obvious a conclusion that it needs no comment.

Heyerdahl writes: "Since it is generally agreed among Polynesian scholars that the neolithic people who brought these blade types (*i.e.* the various types of stone adzes) to Polynesia arrived in separate waves, roughly over a period from 500 A.D. to 1300 A.D.,[3] Heine-Geldern realizes the obvious chronological difficulty in bringing them straight in from the contemporary Iron Age of the Old World. He suggests as an alternative that the Polynesians themselves have reached the Iron Age in Asia but that, after a migration through coral atolls, they would have lost all memory of metal work after fifty or sixty years. If they were so forgetful, how then, we may ask, could they remember in Polynesia what specific stone adze types their long lost ancestors in China had manufactured at a time even before they had used bronze or iron."

Were this a correct presentation of my views I would have to confess to having written utter nonsense. What I really said was that neolithic cultures persisted in some parts of Indonesia until late in the Christian era and that, even where

[1] *Geogr. J.* 117 (1951) 69–77.

[2] *Geogr. J.* 116 (1950) 190.

[3] There is, of course, no general agreement on this matter among scholars. I shall deal with this subject elsewhere.

bronze or iron had become known, the use of stone tools continued for a considerable time. These are facts every prehistorian familiar with the region will be able to confirm.[1] I further pointed out that "it is not inconceivable that the ancestors of the Polynesians, while still in Indonesia, might have come into contact with metal-using peoples or might even themselves have used metals to a certain extent."[2] This is quite different from suggesting "that the Polynesians themselves have reached the Iron Age in Asia." To imply that I had said that they had given up the making of stone tools and ironically to ask how the Polynesians, after having entered the Pacific, could have remembered "what specific stone adze types their long lost ancestors in China had manufactured," is an irresponsible and unfair misrepresentation of what I had written.

Heyerdahl again says: "Heine-Geldern suggests yet another explanation; iron was already in general use in Indonesia by the first or second century A.D. where, according to an earlier publication of his, it spread more rapidly than Hindu culture, and at the time of Polynesian migrations only isolated and backward savages had not acquired its use. It is from these isolated and backward savages that, we are now to infer, trans-Pacific voyagers set out, still with a Stone Age culture, at this late date."

I never said that iron was in general use in Indonesia in the first or second century A.D. It certainly was not. The passage in my paper which Heyerdahl cites, reads as follows:

"It is probable that its (*i.e.* iron's) general use started only *after* the establishment of the first Hindu colonies in the Archipelago (first or second century A.D.?). However, it spread more rapidly than Hindu culture, and since many tribes in remote islands and in the interior of Borneo and Celebes remained outside organized Hindu or Mohammedan rule and some of them continued to live under 'prehistoric' conditions as late as the beginning of this century, we may well speak of a prehistoric Iron Age."[3]

I do not think that any person with a minimum of archaeological and ethnological knowledge could have misunderstood what I meant, *i.e.* that the general use of iron in Indonesia began only after the establishment of Hindu colonies in the first or second century A.D.—but how long after the establishment of those colonies I did not say; nor do I, nor does any one else, know for certain. In regions immediately adjacent to those colonies iron may have been in general use within a few decades, while its spread to more distant areas took centuries or, in certain instances, a millennium or more. Heyerdahl's assumption that those peoples of Indonesia who retained neolithic cultures until a late date must have been "isolated and backward savages" who could not have migrated into Polynesia, is, of course, totally unwarranted. There is no reason to assume that the higher type of late neolithic peoples in Indonesia were on a lower cultural level than the Polynesians.

Heyerdahl further writes: "The pre-Inca graves contemporary with Tiahuanaco contain no bronze, iron, or other hard metals, whereas Heine-Geldern himself once wrote of the megalithic graves in Indonesia he now seems to propose as proto-Polynesian: 'All the stone cist graves of South Sumatra, Central and East Java contained glass beads and metal, bronze, gold, copper, or iron.

[1] Only recently have I learned from a missionary on the island of Flores, in the Lesser Sunda Islands, that even today stone axes are still used there for felling the trees set up as sacrificial posts in certain rituals.

[2] *Geogr. J.* 116 (1950) 186.

[3] Heine-Geldern, "Prehistoric research in the Netherlands Indies," in 'Science and scientists in the Netherlands Indies' (New York 1945), p. 148.

The same was the case in similar graves that have been investigated in the Malay Peninsula.' "

Here again Heyerdahl completely misrepresents what I wrote. I never proposed that the stone cist graves of Indonesia were "proto-Polynesian." On the contrary, I distinguished between an earlier and a later megalithic culture, stating that the stone cist graves belong to the latter. I expressly pointed out that this later megalithic culture never reached Oceania. Here are my words, which Heyerdahl either did not read or did not understand: "While the older megalithic culture spread over wide regions of Indonesia and from there to Oceania, the area of the younger megalithic culture is much more restricted." [1]

Heyerdahl asserts that the megaliths of what he chooses to call "the eastern fringe of Polynesia" are "far beyond the range of Assam and Java," thereby creating the impression that I had tried to link eastern Polynesia directly to Java and Assam without taking into account the enormous distance which separates them. Actually, I had pointed out that a practically continuous megalithic area extends from Assam to eastern Polynesia, a fact with which any person pretending to solve the Polynesian problem ought to be familiar.[2]

I cannot help feeling somewhat amused by Heyerdahl's holding up to me, as proof of the American origin of the Polynesians, what he calls the "Ekholm Exhibit." He means the exhibition, "Across the Pacific," set up on behalf of the American Museum of Natural History by Gordon Ekholm, Junius Bird and myself on the occasion of the International Congress of Americanists, held in New York in 1949. I can assure him that none of us three ever suspected that we had contributed any argument in support of his thesis of the American origin of the Polynesians, but that, on the contrary, we were convinced that we had proved Asiatic and Oceanic influences in pre-Columbian America.

14 *December* 1951. ROBERT HEINE-GELDERN

CULTIVATION TERRACES IN NIGERIA

In the course of the discussion on Mr. Grove's paper on south-east Nigeria as reported in the September issue of the *Journal*, the question of terraced agriculture was raised. As Professor Stamp points out, terraces occur elsewhere in Nigeria. They are to be found in many parts of the Jos Plateau, *e.g.* at Pankshin, Hoss and in the Lere hills. Here though bold, the terracing is rough and only approximates to a contoured lay-out. Sometimes adjacent lines of walling coalesce, sometimes a line simply peters out, so that there is no regularity in either the width or slope of the terraces. Their height however is fairly constant at a matter of 2 or 3 feet in the cases known to the writer. He has been told by the village schoolmaster of Lere that in his opinion terracing was not a practice learned from outside but one spontaneously developed by a people who, cultivating rough hill-sides, had many stones to dispose of. The terraces, in his opinion, grew gradually; as stones were unearthed during hoeing they were laid on one side. But soil creep banked the earth against them and made their utility obvious so that further stones, as they came to light, were added to the rows and the terraces grew till stability was reached.

Farther east, in the Gombe area, slightly higher and more regular terraces occur on the hilly ground, but the most perfect development of terracing is found in Dikwa Emirate in the Cameroons, under British Mandate, where the

[1] Heine-Geldern, "Prehistoric research in the Netherlands Indies," in 'Science and scientists in the Netherlands Indies' (New York 1945), p. 151.

[2] *Geogr. J.* 116 (1950) 188–189.

hill pagans farm on terraces which, as recorded by Stanhope White, are sustained by walls of perfect dry-stone building. These walls average four feet in height but in places attain ten feet. The local tradition is that their forefathers found the terraces in being when they first occupied the area. Mr. White has found one late Paleolithic and one early Neolithic artifact on terraces in the area.

In these northern hill areas, recourse to terracing was not, as in the Ibo country, the result of pressure of population on land in the ordinary sense. These simple people were driven to the hills by the incursion of conquering incomers who, with the horse and the sword, brought the plains under their control but stopped short when confronted by rocky hills. With the *Pax Britannica* then, and the passing of the older generation who clung to their mountain birthplace from sentiment, the northern hill peoples are tending to move downhill into more spacious fields and the terraces are accordingly tending to be abandoned.

4 *December* 1951 RONALD MILLER

ENGLISH WATERING PLACES

In his paper in the last issue of the *Journal* on "The changing English landscape" Professor H. C. Darby mentioned the rapid growth of English watering places in the first half of the nineteenth century. He made reference to a table in the *Census of Great Britain*, 1851, which grouped together 15 watering places and recorded the increase in their total population between 1801 and 1851 as 254 per cent. In commenting on this table Professor Darby said "Four of these watering places have since passed the hundred thousand mark . . . Brighton, Southend, Bournemouth and Blackpool." It should be pointed out that, of these four towns, only Brighton was included in the list of 15 watering places in the 1851 census. Professor Darby's words imply that Southend, Bournemouth and Blackpool are also in the list, but this is not the case. The towns named in the 1851 census were the four inland watering places of Cheltenham, Bath, Leamington and Tunbridge Wells; and the eleven coastal resorts of Brighton, Ramsgate, Margate, Worthing, Weymouth, Scarborough, Ryde, Cowes, Ilfracombe, Dover and Torquay. The fact is that in 1851 Blackpool (Layton-with-Warbreck) had only about 2500 inhabitants, Southend little more than 1100, and Bournemouth a mere 700; all three places were then quite insignificant by comparison with Brighton which already had a population of more than 65,000 persons. E. W. GILBERT

22 *January* 1952

COLONIAL SURVEYS

Sir Charles Arden-Close does not, I am sure, argue that because the old Colonial Survey Committee was virtuous there shall be no more "cakes and ale." But Dr. Harrison Church does seem to suggest that because there is now an accepted necessity for more "cakes and ale," therefore nothing was ever done before to provide any at all. His hand-picked quotations do nothing to support that view.

Dr. Church may also be unaware of the work done by the Colonial Survey Committee between the wars in fostering the growth of Colonial Survey Departments, and of the amount of topographic mapping which many of them did in fact turn out. The first possibility of more direct assistance from the Home Government came with the 1929 Colonial Development Act, but the main defect of that measure, not only in relation to survey projects, was a virtual restriction to short-term schemes which could be completed within a

financial year. The 1940 Act increased the total amount, but it became possible to initiate schemes continuing over a ten-year period only after the passage of the 1945 Act. The Colonial Survey Committee saw this coming long before the Act was passed, and indeed formulated the plans now in execution.

It is not clear what more might have been achieved by an academic geographical adviser, *qua* geographer, who as Dr. Church rightly implies would not be a cartographer. It is one thing to offer advice and quite another to get it accepted, ultimately by those who have to answer to the British electorate for the result. If we are asked to believe that geographers, who are not cartographers, have special qualifications for that purpose, then Dr. Church does not seem to offer much evidence of them. Advice which suggests that, because other Colonial Powers have omnibus Colonial atlases, therefore we must, is too far out of touch with the British character to stand much chance of acceptance; so is advice which blissfully ignores any administrative, financial or technical limitation; and least of all is there much hope for advice, based solely on the past, which so persistently cries wolf that its unfortunate recipients are driven to see a happy release in being eaten by one.

It may just be worth considering whether geographers would not do better to concentrate on the undoubtedly high educational value of their subject, as perhaps the last stronghold against over-specialization, instead of trying to turn themselves into an oracular profession.

M. HOTINE

Directorate of Colonial Surveys

7 *January* 1952.

GEOGRAPHY IN THE SERVICE OF MANKIND

Professor Linton's account, in the December issue of the *Journal*, of the proceedings of Section E of the British Association at Edinburgh last August includes a brief mention of the paper[1] which I was priviliged to read and the following statement is made: "In response he (Mr. Giffard) received some assurance that the professional services of geographers are more widely sought and utilized than he was possibly aware of."

Now my friend Professor Linton was kind enough to offer me a very gracious apology for his inability to be present when my paper was delivered and that may account for the inaccuracy of this statement. In point of fact no such assurance was given nor could it have been given because the facts are not in dispute and because everyone knows that, outside teaching, there are practically no posts open to professional geographers save those few to which I referred.

In the discussion which followed the paper (which, by the way, was curtailed) Professor Dudley Stamp had some mildly comforting things to say about the possibility that a geographical training might, before so very long, come to be regarded as a good, basic preparation for a career in administration or business and he suggested that newly qualified geographers should not "run around with a flag in their hats asking for employment as such" but should be content to regard their geographical training as a general qualification rather than a specialist one. Whilst that may, indeed, have been good advice it seemed to me to prove my contention—that is to say it went to prove that it is useless for the geographer to seek for *geographical* posts in industry or business or administration.

I may perhaps be allowed to add that, out of some scores of congratulatory letters from University geographers (Professors, Readers and Lecturers) which

[1] Since published in *Nature*, 168 (1951) 314.

I have received since the paper was delivered, not one correspondent contests the truth of what I had to say. Perhaps those who disagreed with me decided to hold their peace; thereby helping to prove another of my contentions which was that many geographers seem afraid to enter public controversy. "Hear all, say nowt." may be a good Yorkshire proverb but, like all proverbs it has its converse, which, in this case is "Them as says nowt have often nowt to say."

24 *December* 1951 E. O. GIFFARD

I think the significance of Mr. Giffard's guarded and diplomatic comments in his paper at the 1951 Edinburgh meeting of the British Association, on the deficient status of geography in the eyes of men of affairs, was rather underestimated by a largely academic audience. While it is happily true that the geographer is now gaining some professional recognition it must be admitted that progress in this direction is unreasonably slow.

I would like to make the comment that well-qualified University geographers should be much less fearful of stepping out into administration, industry, diplomacy, the Services, or commerce. They will find that, while the personality of the individual is the paramount ingredient in success, the broad and flexible vision acquired in a University training in the subject will prove of inestimable value. Although a geography degree was not specifically mentioned there, the speakers at the recent conference in Harrogate of the British Institute of Management clearly had in mind the kind of training acquired through a University geography course, when they concluded that an arts graduate was better fitted to make decisions in business and public life than was the graduate in physical science.

It is my personal belief moreover that a University professor of Geography will normally be of much more value to his students if he has stepped out for a time into the world of practical affairs. He will be more likely to have retained that broad vision without which the subject virtually ceases to exist, and breaks down into specialisms which can with some justification be considered merely as branches of other disciplines. F. H. W. GREEN

11 *January* 1952.

VOLCANIC ACTIVITY ON KILIMANJARO

It seems a pity that, having reached Peg One as reported in Mrs. Betts' letter in the last issue of the *Journal*, Mr. Milton could not have walked the necessary few hundred yards to the main fumarolic areas in the south-west and north-west quadrants. Peg One marked an isolated fumarole only.

The desideratum is information concerning the two demarcated sections of sulphur beds which include, respectively, pegs 2 to 5 and pegs 6 to 15 (in 1945 I inserted further pegs to mark an apparent extension since 1943 of both these beds). In addition, information is required on the very active fumaroles of the north-east quadrant. I hope that a further attempt will be made to obtain data upon which conclusions can be based regarding an overall trend towards either an increase or a decrease of activity since July 1943.

At the same time glaciologists would be grateful for more information on the large ice masses lying in the caldera, especially the large isolated blocks. I would particularly mention the large ice block lying to the south of the "ice dome." In February 1945 I estimated its height at 30 feet and the actual circumferential measurement was about 250 feet. Does this block still exist? Photographs of the various masses, both individually and in a panorama, could be compared

with those of previous years. Such information is urgently required in helping to assess the rate of regression and desiccation of these rare and dwindling equatorial glaciers which, in their function as an index of climatic change, furnish invaluable data for climatologists. P. C. SPINK

14 *January* 1952.

THE DEFINITION OF GEOGRAPHY

Certain geographical definitions were presented for criticism in the December issue of the *Journal*. With regard to the word "geography" it may be well to remind ourselves of previous definitions, especially the two following.

In 1891 Dr. Scott Keltie adhered to the definition of the subject put forward by Ritter, Peschel and Ratzel—"Geography as a whole is regarded as that department of knowledge which studies the varied features of the Earth's surface as the environment of mankind."

In 1908 a committee of the International Geographical Congress issued a pronouncement on geography considered as a branch of education. It is rather a long definition,[1] but the essence of it is—"La géographie, en tant que branche d'enseignement, a pour object la description de la surface de la Terre, . . . la géographie doit tendre en première ligne à mettre en evidence les relations entre le monde inorganique et les êtres vivants, et plus particulièrement entre la surface de la Terre et l'homme." C. F. ARDEN-CLOSE

30 *December* 1951

SURVEYING IN THE NEW HEBRIDES

It is possible that the following remarks may be of interest to those who are planning small scientific expeditions in which map-making is to be attempted by persons who have not been trained in surveying.

In 1927 Mr. J. de H. Morel, my wife and I explored the lake on Gaua Island in the New Hebrides, which had not previously been mapped and is by far the largest sheet of fresh water in Melanesia. It is a huge crater-lake, nearly four miles long and some 325 feet deep; a secondary volcanic cone, thrust into its western shore, makes it crescentic. It was in reference to this cone, now in the solfatara stage, that I gave the name "Steaming Hill Lake." Our main interests were biological and we had had no formal training in survey-work, but we measured a base about three-quarters of a mile long on the shore and surveyed the lake by prismatic compass. A map was drawn from our survey by my brother, Lieut. S. J. Baker, R.E., and published in the *Journal* (73 (1929) 305). Since then I have often wondered when the lake would first be mapped by trained surveyors, and what defects in our work would then be revealed.

Our map was copied by the U.S. Hydrographic Office in compiling their Chart No. 2877 (1945). The American Army has since made its own survey of the island and the Executive Officer of the Corps of Engineers, Lieut.-Col. Robert N. Smith, has written to me as follows about the new edition of the American map, resulting from this survey: "It is based on aerial photography, and emphasizes the excellence of your survey work in the similarity of Steaming Hill Lake as it appears in the two AMS editions. The Army Map Service . . . offers its compliments on the product of your survey."

In 1933 Mr. T. F. Bird and I (both of us biologists by training) surveyed the mountains of western Espiritu Santo, as members of the Oxford University

[1] *Geogr. J.* 113 (1949) 145.

Expedition to the New Hebrides. Our map, which was also published in the *Journal* (85 (1935) 209), was used by the American Army Map Service in making its Map No. X401 (1943–4). The following incident may be mentioned. During the war, when Espiritu Santo was occupied by the forces of the U.S.A, two American soldiers, Mr. Mark Nero and a friend, ascended the lower of the two peaks of Mt. Tabwemasana, the highest of the mountains of the New Hebrides, and found the bottle we had left at the summit of this peak about ten years before. It contained an account of our ascent, and most of what I had written was still legible. In his letter to me Mr. Nero remarks that his "ego was considerably deflated" when he found that this peak had been climbed by a woman (my wife). Mr. Nero and his friend did not attempt the higher peak (about 6195 feet), which was climbed for the first (and only) time on 30 October 1933 by Mr. T. F. Bird, Mr. Tom Harrisson, my wife, and myself, with a party of natives.

It is a pleasure to take this opportunity of acknowledging our indebtedness to my brother for his advice on simple surveying, and for making maps from our surveys of 1927 and 1933–4. JOHN R. BAKER

21 *December* 1951.

MEETINGS: SESSION 1951–52

Sixth Meeting, 3 December 1951

Films: Kingdom of Jordan. Colour films with a commentary by Sir Clarmont Skrine

Seventh Meeting, 10 December 1951. Professor J. A. Steers in the Chair

Paper: Erosion surfaces of the Exmoor area. By W. G. V. Balchin

Eighth Meeting, 17 December 1951. The President in the Chair

Elections to Fellowship: David A. Adebiyi; John L. Ballantyne; Donald Craig Boyd; J. M. Burnett; Miss Rosemary F. Carr, B.SC.; James Harvey Chaplin; Ernest W. Cullen; Maurice W. Dybeck; Captain John C. C. Foott; Philip R. C. Fox; G. D. M. Goodwin; R. C. T. Hildyard; Douglas A. Hill, M.A.; Mrs. Mary R. Husian; Philip F. Hutchins, B.A., F.G.S.; Miss Constance L. Ives; Major Denis E. H. Hayward, M.C., B.A.; William J. Leonard, B.A.; John H. Lowry, B.A.; Dr. John McArthur; Lindsay A. MacMillan; Philip G. Maddocks, B.A.; E. W. N. Mallows, M.A.; Frank H. Miller, B.SC.; Jonathan J. Ofei; Francis K. C. Pike, B.SC.; Edward C. Rowlands; John H. Sewell; Dr. Karl A. Sinnhuber; C. G. Smith; J. W. Trevett; H. H. B. Valentin; Dr. S. G. Willimott; Lloyd Earl Young, A.B.

Transferred from Associate Membership: E. C. F. Bird; Miss Joan Blaylock; Austen D. Bott; Miss Betty J. Cheetham; Miss G. M. Davies; L. M. Fanchette; D. P. French; Kenneth Ginger; Miss V. A. Harding; Francis D. Hartley; Patrick H. Kenney; H. L. Plummer; Donald P. Schofield; J. D. G. Smart

Elections to Associate Membership: Miss Ann S. Austen; Kenneth A. Coyte; John Frederick Davis; Miss Rosalie Eastlake; Miss Jacqueline D. Fowler; Miss Jean McKane; Miss Eleanor M. McKee; Miss Dorothy M. Robinson

Paper: Geography of power. By the Rt. Hon. the Earl of Verulam, J. Houston Angus and Stephen Chaplin

Christmas Lectures. 28 December 1951: Jumbos and jungles, by J. H. Williams ("Elephant Bill"); 31 December 1951: Scott's last expedition, introduced by Professor Frank Debenham

Ninth Meeting, 3 January 1952. The President in the Chair

Paper: India's food problems. By Sir John Russell, F.R.S. (The joint annual meeting with the Geographical Association)

Tenth Meeting, 14 January 1952. The President in the Chair

Elections to Fellowship: Miss Marion A. Bendall; F. A. Betterton; George F. Braby; Miss J. Caldwell-Smith; John Hall Campley, B.A.; Harold John Cooke; Flt.-Lt. K. Courtnage, A.F.C., R.A.F.; Idise O. Dafe; Robert E. J. Davis; Prof. João Dias da Silveira; John C. W. Field; Harold Gould; R. J. M. Hart; C. J. Hunter, B.A.; Mrs. Oxton Jones; A. Lunn, B.A.; John Henry Marsh; David N. McMaster, M.A.; Herbert A. I. Madgwick, B.SC.; Miss Diana I. Momber; Kelvin Nicholson, B.SC.; Miss Mary A. Parsons; Lieut. R. J. Rawe, R.N.; Herbert J. Savory, M.A.; Gordon Stirn; Mrs. Gillian Stone, M.A.; Alan G. Tritton; James Turner; John Van Sommers; Edward Charles Weeks; John Brian Wills; K. J. Wyness-Mitchell

Transferred from Associate Membership: Geoffrey C. Ball; D. V. Brown; C. G. Champ; John L. Glasscock; Miss Patricia D. Hinton; Ian D. Kember; Captain John H. Maynard; P. A. Noyle; Brian B. Tatford

Elections to Associate Membership: George M. Betts; Miss Cynthia Dance; Miss Jennifer Docking; Frederick C. Evans; Miss Audrey M. Leach; Jolyon Christopher Manning; Geoffrey L. Pye; Michael W. Smith; Miss Margaret T. Thomas; John C. Wilkinson

Paper: The new political geography of inner Asia. By Owen Lattimore

Eleventh Meeting, 28 January 1952.

Films: The quest of the schooner *Argus*. Colour films with a commentary by Alan Villiers.

Twelfth Meeting, 4 February 1952. The President in the Chair

Elections to Fellowship: Leslie George Abberton; Mrs. M. C. Allen, B.A.; Terence L. Bowles; Basil Cantes; Prof. H. B. Carroll; Major L. B. Croston, B.SC.; Captain A. W. Crown; Miss Ann Debenham; Edward S. Dollimore; R. A. Dudley, B.SC.; Miss Barbara Ellis, B.A.; Brian A. Evans; Charles H. French; Jimoh A. Gbadamosi; Robert P. Harvey; Theodore G. Homer; Colin G. Irving-Bell; Miss F. M. D. Jewsbury; Frederick H. Johnson; Miss Doreen M. Law; Norman G. Manley; A. Megafu; The Rev. R. W. A. Mitchell, LL.D.; A. R. G. Morrison; The Rev. H. H. Orr; John Pearce, B.A.; Peter E. Petts; F. B. S. Price, B.SC.; George V. Price, M.B.E.; Frank G. Raath, B.ECON.; Major T. W. Ratcliffe; Percy Rose; Peter C. Roseveare; Mrs. Gilbert Stratton; Peter A. Titchmarsh, B.A.; The Rev. Ll. G. Tudor, B.A.

Elections to Associate Membership: Miss Gwyneth M. Haslam; John Roe Lingren; Miss Kathleen M. E. P. Oliver; James Lewis Sumner; Miss Constance H. Tyler; John Alva L. Wood

Paper: Everest Reconnaissance, 1951. By Eric Shipton

THE ROYAL GEOGRAPHICAL SOCIETY

KENSINGTON GORE, LONDON, S.W.7

FELLOWSHIP AND ASSOCIATE MEMBERSHIP

The object of the Society being the Promotion and Diffusion of Geographical Knowledge, it has always welcomed to its Fellowship those anxious to further this object by their interest and support, as well as those able to take a more active part in the work of discovery and exploration.

It is provided by Chapter III, § 1, of the Bye-Laws that a candidate for admission to the Fellowship of the Society must be proposed and seconded by Fellows. Further, that a candidate is not to be considered eligible until he has attained the age of twenty-one years, unless he holds a Commission in Her Majesty's Forces or is a matriculated student of a University of the United Kingdom or the Self-Governing British Dominions. Proposal forms can be obtained on application to the Director and Secretary, who will also lend if necessary a List of Fellows.

Chapter V, § 1, of the Bye-Laws provides that—

(*a*) *Every Fellow (other than those elected under Chapter III, § 6) shall, except as provided below, be required to pay either on Election Five pounds as Entrance Fee and Three pounds as Annual Subscription for the current year and thereafter an Annual Subscription of Three pounds due on January 1 in each year; or instead of an Entrance Fee on election an enhanced Annual Subscription of Four pounds for the current and five following years, and thereafter Three pounds; or a single Compounding Fee of Sixty pounds.*

For Fellows who are under the age of 25 years on election the Entrance Fee shall be reduced from Five pounds to Two pounds; or alternatively the enhanced Annual Subscription of Four pounds shall be payable for the current year and for two following years instead of for five.

Fellows who are on election the wives or husbands of Fellows shall pay no Entrance Fee.

Fellows who are on election the widows or widowers of Fellows shall pay no Entrance Fee if elected within one year of the decease of husband or wife.

(*b*) *Fellows may compound for their Annual Subscriptions at any subsequent time by a payment of £60 (sixty pounds) less £2 (two pounds) for each Annual Subscription paid in excess of five with a minimum of £20 (twenty pounds) after 25 payments.*

(*c*) *No Fellow shall be entitled to vote or to enjoy any privilege of the Society while in arrear.*

Chapter IIIa of the Bye-Laws, covering the terms of Associate Membership, provides that—

1. *Candidates must be not less than 17 and not more than 20 years of age. They must be recommended by a Fellow, University or School authority.*

2. *Subscription shall be £2 per annum without Entrance Fee.*

3. *On attaining the age of 21 Associate Members become eligible for Fellowship. The Entrance Fee of £5 shall be waived provided they have been Associate Members for 3 years. Otherwise Associate Membership shall cease at the age of 21.*

All subscriptions are payable in advance, on the 1st of January in each year.

The privileges of a Fellow or Associate Member include admission (with one Friend) to all ordinary Meetings of the Society, and the use of the Society's House, Library, and Map-room. Each Fellow is also entitled to receive a copy of all the Society's Periodical Publications. Associate Members have the choice of receiving either *The Geographical Journal* or *The Geographical Magazine*. Associate Members may not describe themselves as F.R.G.S. and have no vote at Annual or Special General Meetings.

A pamphlet giving a brief History of the Society, with a description of its Work and Publications, its Charter and Bye-Laws, and an illustrated account of its House in Kensington Gore, can be sent to anyone interested on application to the Director and Secretary.

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